4 Pulief Pistons and Cylinders

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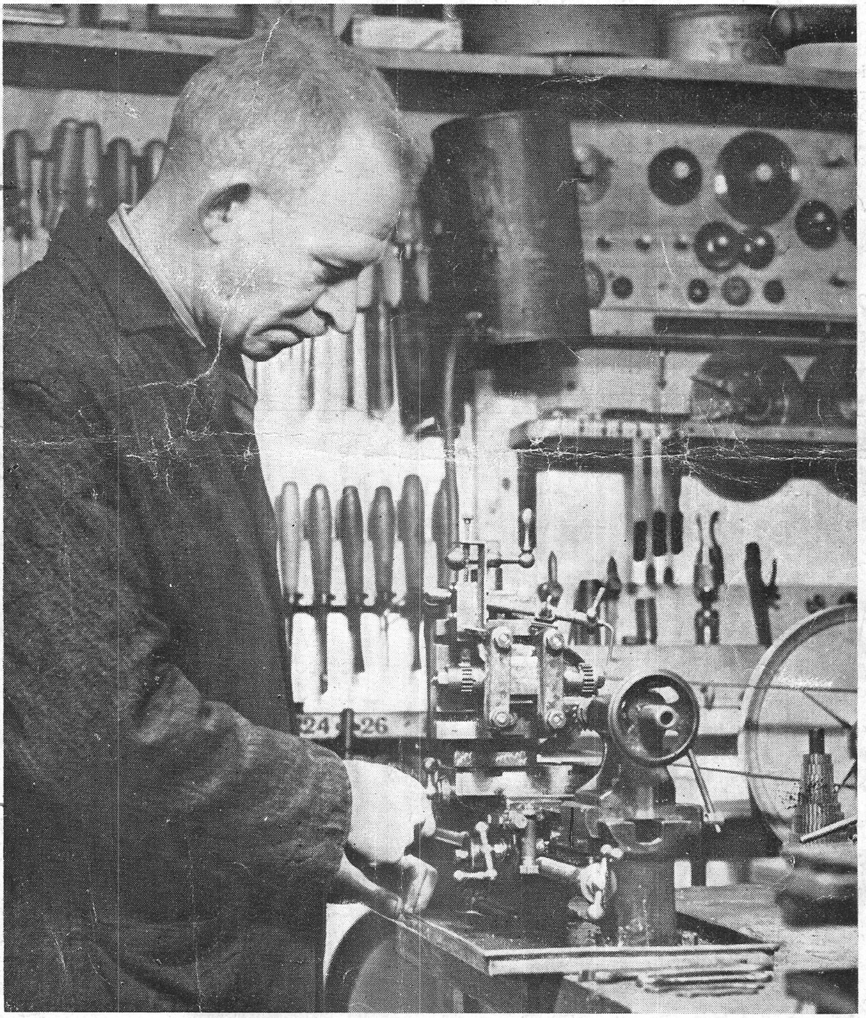
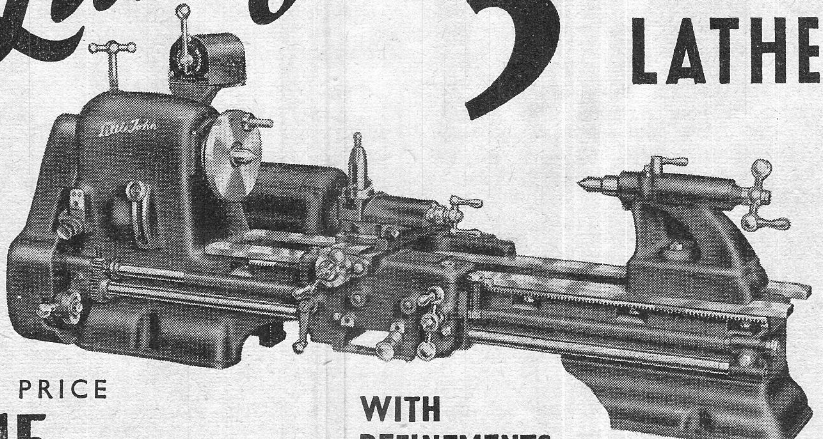
THE MODEL ENGINEER

Vol. 95 No. 2379 THURSDAY DECEMBER 12 1946 6d



Col. Niall MacNeill taking his leisure in the right and proper way! He is a member of the Dublin Society of Model and Experimental Engineers, but is known to our readers through his contributions to the "M.E." His latest, describing the "M.E." Petrol Lighter, is published in this issue

The Little John 5" CENTRE LATHE



PRICE

£115 EX/WKS.

Complete as illustrated, including 3-phase electrical equipment. Accessories also available. £1 10s. 0d. extra for single-phase; £5 0s. 0d. extra for D.C. H.P. terms can be arranged.

Sole Agents–Home and Export:

The Acorn Machine Tool Co. (1936) Ltd.,
610-614, Chiswick High Rd.,
London, W.4

WITH REFINEMENTS

hitherto associated only with high priced equipment
One simple lever movement gives an **infinite** spindle speed range of 1750 to 290 r.p.m. ungeared and 260 to 38 r.p.m. with back gearing. Bed ways hardened and ground. Simplified change wheel selections for cutting threads 3 to 48 per in. Separate feed-shaft. Leadscrew instantly disengaged when not required. Timkenised spindle, bored for 1-in. bars. Detached power feeds with micrometer dials. Swing over bed, $10\frac{1}{4}$ in., over saddle $6\frac{1}{2}$ in. A sturdily built machine, easy to handle and dependable for long life.

SPECIFICATION

SPINDLE.—Amply proportioned, and bored to pass 1 in. dia. bar. Nose has two locating positions, the threaded position being used for tightening purposes only. True running is thus permanently assured. Timken roller bearings are fitted as standard.

HEADSTOCK.—Cast integral with bed.

SADDLE.—Sturdy construction with conveniently arranged controls. Traverses are by means of feedshaft which provides power feed both longitudinally and crosswise. Micrometer dials, reading in thousandths, arefitted. The leadscrew is used only for screwcutting and thus maintained in good condition over a lengthy period.

BED.—Rigid construction and ample weight. Fitted with two hardened and ground steel slides of ample section. Wear practically eliminated and alignments maintained indefinitely. Replacement is simple should it be ome necessary

SCREWCUTTING. Reference to the chart will show the requisite change wheels and indicate their position in respect to studs A, B, C and D. Slip washers permit quick assembly. Change wheels are supplied for all normal threads, but others are available for special or metric threads.

DIMENSIONS.

Height of Centres	$5\frac{1}{8}$ in.
Swings over Saddle	$6\frac{1}{2}$ in. dia.
Admits between Centres ...	24 in.
Bore of Hollow Spindle ...	1 1/32 in.
Spindle nose bored	No. 4 Morse
Size of Centres used	No. 2 Morse
Dia. of spindle nose	$1\frac{3}{4}$ in.
Spindle nose threaded ...	6 T.P.I.
Leadscrew, $\frac{3}{4}$ in. dia.	8 Thds. per inch
Width of Bed	$6\frac{1}{8}$ in.
Width of each hardened slide	$1\frac{1}{2}$ in.
Overall length of Bed ...	43 in.
Length of Saddle	$9\frac{5}{8}$ in.
Cross feed travel	5 in.
Toolpost Slide travel	$2\frac{1}{4}$ in.
Feedscrew graduations ...	0—.1 by .001
Micrometer dial dia.	2 in.
Motor, $\frac{1}{2}$ h.p. (A.C. or D.C.) ...	1425 r.p.m.

SPEEDS AND FEEDS

Spindle ungeared	1750—290 r.p.m.
backgeared	260—38 r.p.m.
Longitudinal traverse	.003 to .050 per rev. of spindle
Screw Threads cut	3 to 48 per in.
Metric	.25 to 4 mm.

Overall dimensions—4 ft. by 2 ft. $1\frac{1}{2}$ in. by ft. 9 in.

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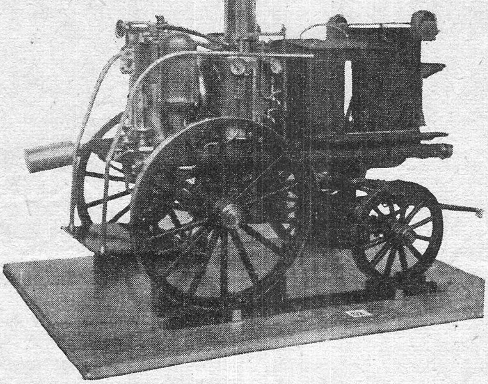
THE
MODEL ENGINEER
Percival Marshall & Co. Ltd., 23, Great Queen Street, London, W.C.2
VOL. 95. No. 2379. DECEMBER 12th, 1946

SMOKE RINGS



To Wish You Well

THE season is close at hand when we lay aside our daily tasks and workshop tools to take up a pen and send greetings and good wishes to our special friends. Since you are all members of the great model engineering family over whom it is my privilege to preside, I think some of you may like to put into writing your regard for your brother model engineers. To facilitate the broadcasting of your friendly greetings let us have a little competition. I will give a prize of £2 2s. for the best New Year message from one reader of THE MODEL ENGINEER to all his fellow readers, expressed on a post-card and addressed to me. I am not seeking your good wishes to myself, I know I have those without asking for them, but I would ask you to put into words or picture the good wishes you would like to extend to all your brother readers. Some of you, I know, have the gift of humour, and I will give another prize of £2 2s. for the best expression of goodwill in an amusing vein. So whether you feel grave or gay, here is an opportunity for you to cement that feeling of brotherhood which I know exists between you all. I shall hope to publish a selection from the entries early in the New Year, giving the prize-winners the place of honour and quoting as many other of your messages as their character and our space will justify. Please remember—on a post-card, addressed to " Smoke Rings," to reach me not later than December 27th. Let us circulate a little goodwill, or raise a friendly smile, to start the New Year on a cheerful note and defeat old Giant Gloom. I am hoping for a heavy post-bag.

American Railway Progress

I AM indebted to Mr. William Atkin, of Darien, for a copy of the *Copper and Brass Bulletin*, a publication of the Copper and Brass Research Association of New York. It contains a number of photographs of American railroads and locomotives which not only indicate the immensity of the rail transport problems in the United States but show how much is being done to keep the equipment in line with present needs. A novelty to stimulate tourist traffic is the " Vista Dome " car, intended to run on the California Zephyrs between Chicago and San Francisco. This is a passenger coach with an observation saloon built on the roof. An excellent amenity for open road travel, but, of course, impossible of adoption in the home country with the tunnels and low bridges to be negotiated. Have you any idea of the amount of copper, brass and bronze incorporated in a modern locomotive? I learn from the *Bulletin* that in American practice the average quantity of these metals used in a steam locomotive is about 4,500 pounds. An electric locomotive requires much more, the average being about 30,000 pounds. These figures are quite put in the shade by the new " super-giant " electric locomotive built by the General Electric Company for the Virginian Railway. This engine has a rating of 8,000 horse-power and absorbs no less than 54,000 pounds of copper and its alloys. In contrast with these very modern prodigies of progress, the *Bulletin* gives a picture of the " Tom Thumb," the first locomotive on the B. and O. Railway, engaged in a test race with a horse running alongside the railway track. I gather that the horse won! The " Tom Thumb " had a vertical boiler and engine mounted on a four-wheel chassis of the trolley type. What a contrast to the new mammoths of the railroad!

The Late Mr. H. G. Eckert

LONDON model engineers will learn with very great regret of the death of Mr. H. G. Eckert, a prominent and much valued member of the Society of Model and Experimental Engineers. He served on the Council on several occasions during his long membership and was Chairman in 1938. An outstanding craftsman in the world of models, he gained a Championship Cup at THE MODEL ENGINEER Exhibition in pre-war days, and his advice was always at the disposal of his fellow members. His quiet but pleasing personality will be greatly missed at the Society meetings.

Percival Marshall

The "M.E." Petrol Lighter

By Niall MacNeill

A GOOD petrol lighter must now be regarded as an almost indispensable item of personal equipment. There is nothing new in the idea of making these useful articles at home. Ingenuity is often shown in contriving them from odds and ends, utilising such materials as plumbers' nuts and cartridge cases, or adapting old trinkets, such as silver matchboxes. These, however, in common with less elegant specimens of home production, usually fall short of the standard of working efficiency and easy manipulation by which a lighter should be characterised. Excessive weight or bulk or general crudity of construction are also common faults. On the other hand, commercially-made lighters—as a class—are by no means faultless. Glaring defects and pronounced unreliability are not at all uncommon among them, even in cases of much-vaunted and expensive *marques*.

A lighter is an outstandingly attractive example of the class of utilitarian articles on which the modeller can bestow his skill as an interlude in the work of reproducing large prototypes in miniature. It gives scope for practising a wide range of those techniques which are important to the metalworking modeller. It can—in contradistinction to the type of thing referred to in the first paragraph—be made a real "engineering job," vying with the best of the trade articles in compactness, elegance and lightness, and thoroughly beating the majority of them in efficiency and working reliability.

The design here submitted is the result of extensive experimentation, aimed at discovering not only the best general type but at settling *optimum* shape, dimensions, materials and technique for the home production of the type adopted.

Body Shell

This is made from brass or copper tubing, dimensions not being critical within the following limits :—

Internal diameter .. .. $1\frac{1}{8}$ in. to $1\frac{1}{4}$ in inclusive.
Gauge .. .. 22 to 18 s.w.g. inclusive.

Optimum.—Brass tube $1\frac{1}{4}$ in. outside diameter and 20 s.w.g. ; solid drawn if obtainable but brazed-jointed will give quite good results. This is formed to the shape shown by Fig. 1 by means of the simple device shown in Fig. 2, used as illustrated in Fig. 3. Height, of course, is optional, but anything below $1\frac{1}{4}$ in. is rather squat and of small capacity, while anything above $1\frac{1}{2}$ in. is unnecessarily tall and bulky ; $1\frac{3}{8}$ in. is therefore recommended. Cut a piece rather longer than this from stock and square up the ends to size by filing or in lathe.

The semicircular pieces of the forming device (Fig. 2) are made from $\frac{1}{2}$-in. round stuff (mild steel or even brass will serve) and the wedge-shaped pieces from $\frac{1}{2}$-in. × $\frac{3}{4}$-in. ditto. The rounded pieces must be of full semicircular cross-section ; therefore each must be fashioned from a separate piece of round stock sawn and filed to full and true semicircle. For the rest the dimensions are given by Fig. 4. This contrivance can be quickly made and is worth the trouble even for only one lighter, since it is well-nigh impossible to obtain the truly flat-sided and round-ended shape which is desirable by "free-hand" methods. The blank, after squaring its ends, removing any burrs and annealing, is flattened to rough oval shape and finished off by using the formers in the vice as shown by Fig. 3.

If the raw material was in good condition, very little finishing treatment will be needed after this process, but in any event only major external blemishes should be removed (by abrasives) at this stage. If brazed-jointed tubing is used, it should be flattened in such a way that the joint comes at one of the rounded ends rather than flat sides. Pronounced scratch marks are sometimes left by the manufacturers in the fettling process and these are much more easily removed if the suggestion just made is followed.

The better sequence of finishing the bodywork requires that the baseplate should be fitted and finished first and, generally speaking, the various parts will be described in the sequence in which they are required.

Baseplate

Material: 6 s.w.g. or $\frac{3}{16}$-in. sheet brass carefully filed in plan shape to be an exact push-fit in the end of the shell, its ends being reduced in thickness to about 3/64 in., as shown in Fig. 5. Set into the shell perfectly flush, having first thoroughly cleaned and fluxed the latter to a depth of not less than the full thickness of the thicker part of the baseplate; then proceed with the silver-soldering. Reverse, inspect and, unless satisfied that the solder has thoroughly permeated all parts of the joint, particularly at the thicker part, re-flux and re-heat (open end upwards), adding some grains of solder internally. Clean off any external superfluity of solder or flux. Use an easy-flowing silver-soldering alloy ("Easyflo" is ideal for this purpose).

Filler Cap-screw and Spare Flint Carrier

It may seem odd that this item should be taken at this stage, but the reason will presently be seen. From the points of view of both convenience in use and appearance, the arrangement of filler cap-screw shown by Fig. 6 is superior to others. A suitable size of screw is $\frac{3}{8}$ in. × 26 t.p.i., for which taps and dies are readily obtainable.

The cap-screw is made of brass ($\frac{5}{8}$-in. round) to dimensions shown by Fig. 7. Convenience and appearance are further served by forming the kerf as a wide and dished one, suitable to the use of a coin as screwdriver. A slotting circular saw of from 1 in. to $1\frac{1}{4}$ in. diameter × 3/32 in. or a shade less in width, if not already in kit or obtainable by purchase, is not very difficult to make and for this purpose need not be of high-precision quality. It will form a kerf of best average size to suit all coins from a halfpenny to a halfcrown.

Since the spare flint carrier is a related part, it will be as well to dispose of it now. It is simply a piece of $\frac{3}{16}$-in. round brass machined to dimensions shown in section by Fig. 8. It fits in a hole drilled (No. 24 drill) to a depth of $\frac{1}{8}$ in. in the inner face of the filler cap-screw and tapped 2 B.A., this drilling and tapping obviously being done at same setting in chuck as when machining the cap-screw. Facing the outside of the head and milling the coin kerf in the cap-screw are not done until a later stage.

Machining the Baseplate

Set up the body-shell in the four-jaw chuck, baseplate outwards, as shown by Fig. 9. Use paper or thin card packings on the jaws gripping the rounded ends, to protect the work from marking, and flat metal packings on the other two jaws to give adequate support. Adjust until a point marked equidistant from opposite sides and ends is truly centred. Avoid over-tightening but make reasonably secure. Drill a small pilot hole with a "Slocomb" or stumpy drill. Follow this with tapping size drill (11/32 in.). Counterbore to a depth of $\frac{1}{16}$ in. and diameter of $\frac{5}{8}$ in. This counterbore will break out through the flanks of the work, which is as required. If a pin-drill or

NOT TO SCALE

FIG. 1.

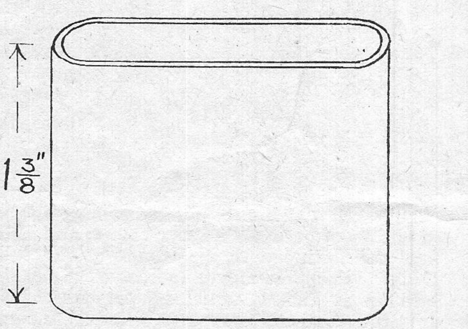


FIG. 2.

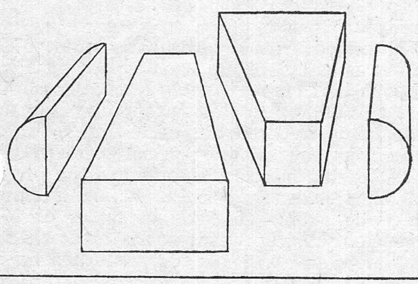


FIG. 3.

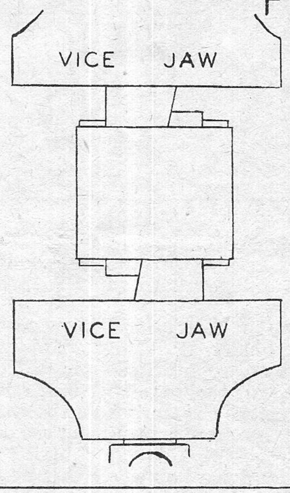


FIG. 4.

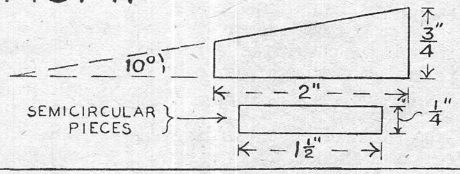


FIG. 5.

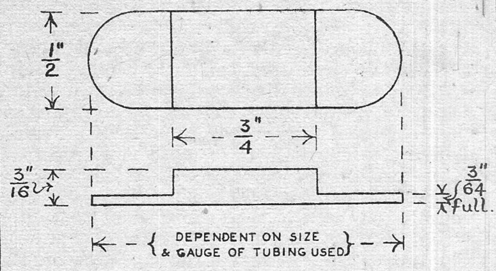


FIG. 6.

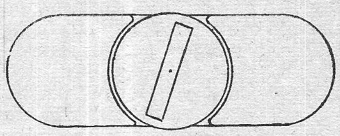


FIG. 7.

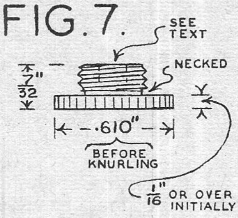


FIG. 8.

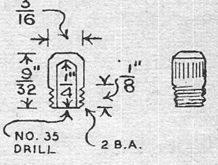


FIG. 9.

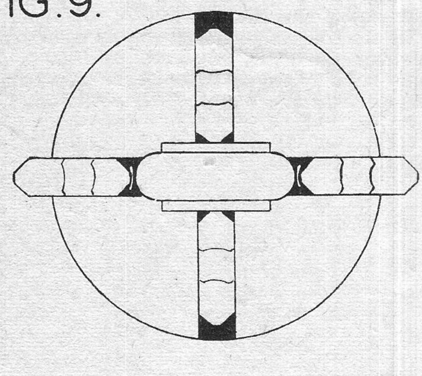
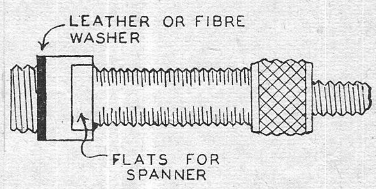


FIG. 10.



counterboring bit having 11/32-in. pilot and ⅝-in. diameter is available, it will do the counter boring; if not, an ordinary boring tool of small size will serve.

Next tap the hole, using ⅜-in. × 26-t.p.i. tap in tailstock holder or chuck. This should be followed by re-application of pin-drill or counterbore or boring tool to remove burr raised by tap. Do not remove the work from the chuck.

A very thin leather washer for the cap-screw is now required (bookbinders' "basil" is suitable material) and can be made either by careful use of a fine scissors or a pair of suitably-sized wad punches. Place this on cap-screw but without, at this stage, using an adhesive.

Screw the cap-screw, with its washer, into the work in the chuck. Unless perfectly satisfied that it can be sent right home by finger-and-thumb method, sweat a piece of brass rodding to it and use this to screw it right in. Part off this rod. Now take a facing cut with a well-sharpened knife tool over the lot, but stop about 1/32 in. short of centre, leaving a little pip about $\frac{1}{16}$ in. diameter unmachined. Repeat if the first cut does not get down to clean metal all over but still leave the pip in the centre.

Finally, rig up the circular slotting saw on a suitable spindle, set at exact centres height, and machine the kerf, driving by a handle or from overhead. The pip we have just left serves as means of rapid visual setting of the saw centrally with respect to the cap-screw head. This completed, the work may be de-chucked. It may be found that the cap-screw is now exceedingly tightly screwed home, but by placing the work in the vice, between leather clams, and using a new coin gripped in a spanner of the "King Dick" variety, it can be loosened. If any slight burring is raised by this operation, a light application of the screw to a piece of fine emery cloth placed on a flat surface will remove it. The cap-screw and both end-plates in any event require such treatment to remove tool marks.

Headplate

This is made from 16-s.w.g. sheet brass, to same contour as baseplate and also an exact push-fit in end of shell. In fact, it should be of such a fit that there will be no fear of its dropping below flush while being soldered nor of having to do any "bridging" by solder, especially at the ends. Soft soldering is quite adequate to the purpose and silver-soldering should not be attempted unless, by choice of grade of solder or other precaution, absolute assurance is made that the baseplate joint will not be disturbed in the process.

Testing for Fuel-tightness

This is easily accomplished by means of a bicycle tyre valve adapted as shown in Fig. 10. A piece of brass, sweated or silver-soldered to the base of the valve, is made a replica of the cap-screw except in having its major diameter about ⅛ in. less than the head of the cap-screw, in order that the adapted valve may not itself conceal leaks in the face of the counterbored orifice. The device is furnished with a leather washer corre-

sponding in major diameter to its head and screwed into the work. Apply pressure with a bicycle pump and immerse in water.

Ignition Head

This is made from 7/32-in. or 5-s.w.g. brass plate or any suitable scrap of brass to shape and dimensions shown by Fig. 11.

One permissible variation is to reduce the overall height of this component to $\frac{3}{8}$ in. and all leading dimensions of working parts (including capping hinge-post) above headplate by $\frac{1}{16}$ in. correspondingly, but this reduction in size introduces minor disadvantages with regard to the flexibility and endurance of the capping hinge-spring and the manipulability of the flint-spring adjusting screw, besides making the various parts more "fiddling" to construct.

It was at first thought that the short flint tube would be disadvantageous, but experience has shown that quite the contrary is the case. This tube or hole is drilled with No. 33 drill and tapped 4 B.A. to a depth of $\frac{3}{8}$ in. *It is imperative* (assuming the later recommended size of flint wheel) that the hole for the flint wheel axle-pin should be drilled at exactly 9/64 in centre or a shade less from the base of the flint-wheel slot. This hole is drilled with No. 51 drill, opened to clearing size above the slot by No. 43 drill (or 42—see later suggestion of using shank of dental burr as axle-pin) and tapped 8 B.A. below slot. A right-through hole and use of taper tap is to be recommended as a much easier job than blind hole and plug tap. The holes in the feet are also drilled No. 43 drill and countersunk.

Hinge Post

Material: same as ignition head. Dimensions as in Fig. 12. Hinge-pin hole is drilled No. 51 drill and opened to clear—No. 43 drill—at outer side "X" and tapped 8 B.A. (Same remarks as to alternative use of No. 42 as clearance drill as in case of ignition-head.) The holes in the feet are drilled No. 43, but only that in the front or shorter foot is countersunk.

Chimney

Made of brass and construction obvious from Fig. 13. The major diameter, 5.5 mm., was chosen simply because a suitable collet was available for chucking, but this diameter should not be less than $\frac{3}{16}$ in. nor greater than $\frac{1}{4}$ in. The through hole is drilled with No. 48 drill,* a size which suits the asbestos wicks later recommended, but if cloth wicks are to be used instead it may be found necessary to drill a somewhat larger hole. In view, however, of the weakening effect on the screwed shank of the chimney and of the fact that a fairly tight hole for the wick leads to efficiency, the increase in size should be very little.

Fig. 14 suggests an alternative and perhaps improved form of chimney in which a square is machined or filed on the body, to suit a small magneto spanner, and the knurling omitted.

* *Incorrectly given in Fig.* 13 *as No.* 28.

FIG. 11.

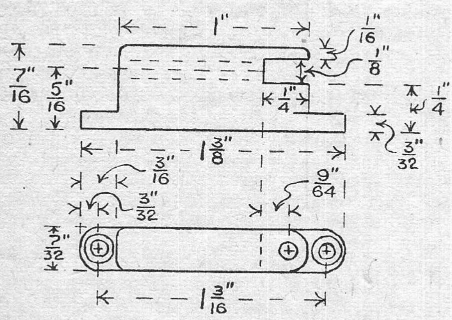


FIG. 12.

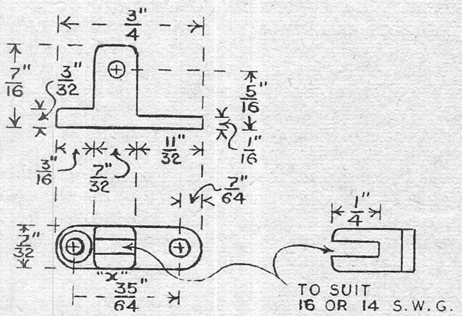


FIG. 13.

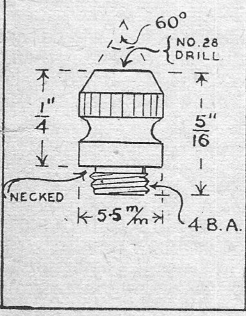


FIG. 14.

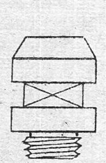


FIG. 15.

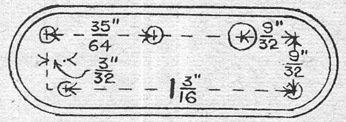
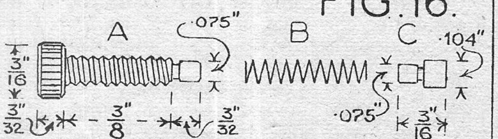


FIG. 16.



The screw in the shank must be a full-thread one right up to the shoulder. To this end the shank may be very slightly necked under the shoulder and it may help to reverse the die when finishing the screwcutting. Necking can be done with a fine parting-off tool made from the blade of a hand hacksaw.

Drilling and Tapping Endplate

The location of holes in the head is as shown in Fig. 15. Their spacing and relative positions should, however, be verified by actual application of the ignition-head and hinge-post to the headplate. No dimensions have been given for distances of the holes from the rim, but these should be such that a parallelogram equivalent to that formed by the construction lines in Fig. 15 is equidistant from opposite sides and ends respectively. An important point is the correct positioning of the chimney centre with respect to the base of the flint-wheel slot. It should lie $\frac{1}{16}$ in. nearer the adjacent end of the headplate rather than be in the same plane.

The hole for this is drilled No. 33 and tapped 4 B.A., all the others No. 51 and tapped 8 B.A. The hole for chimney should be slightly bevelled at rim to facilitate flush fitting of that component.

Extensive experiments have shown that flint wheels having a tooth pitch of about 0.02 in. with radially-faced teeth having no "lands" (or a barely discernible width of land) at their crowns, give best results.

Spiralling or other serration of the teeth confers no advantage in a properly designed and constructed wheel used in a lighter of this kind. The use of such "double-cut" wheels in automatic lighters is a pointer to one of the inherent defects of such lighters—namely that they must rely on doing violence to the flint in order to produce results. For lighters of the kind being described, 9/32 in. is *optimum* wheel diameter and for all lighters using standard flints $\frac{1}{8}$ in. the correct width (across tooth faces); they are therefore cut to 44 or 45 teeth to give correct pitch, 44 being the more exact, but 45 near enough and perhaps easier to set up with available dividing appliances. The fabrication of the wheel is a much easier job than is commonly supposed.

(*To be continued*)

Combined Operations at Billericay

BILLERICAY is a small town in Essex, but we have had a convincing demonstration that it can produce within its boundaries a display of talent that would be the envy of many a large town. From October 30th to November 2nd, the Billericay Youth Club, in conjunction with the Billericay Society of Model Makers, staged an exhibition in the County Secondary School; the proceeds were devoted to the Commandos' Benevolent Fund.

The first hall contained an imposing array of model aircraft, both flying and solid scale, of a high standard. One of the latter took the eye for its general excellence and originality; it was of a crashed Junkers 88, complete with bullet holes and scattered wreckage, a very commendable piece of work, the more so in that it was carried out by one of the junior members of the Youth Club Model-making Class. Also in this hall was a fine model of a destroyer, F71, a complete range of shipping from a tiny barge to the *Queen Mary*, and a display of model fire appliances.

The Royal Air Force had a stand displaying official models of the Warwick Air Sea Rescue Aircraft, Wellington 1C, Seafire XV, and Meteor IV; also, a model of the Avro Tudor II.

The second hall contained a varied collection of more than ordinary interest. The first thing that caught the eye was a comprehensive model of Billericay, accurately carried out to the scale of 1/12 in. to the foot, and measuring 10 ft. × 5 ft., by H. Richmond; its faithfulness to detail would have put many a film-set to shame.

A fine model of the *Crested Eagle* paddle steamer to the scale of $\frac{1}{8}$ in. to the foot, from official drawings, with fully feathering paddle-wheels, nicely detailed and painted, was a joint effort by P. R. Richmond (father of the above) and S. Kemp.

Locomotives were well represented. A 5-in. gauge Great Central Single (the Robinson rebuild) was a nice piece of work by W. G. Roblin. The chassis of 5-in. gauge 0-4-0T of the Gas Light & Coke Co.'s fleet by A. Young, shows promise, and an "L.B.S.C." design, 0-6-0T, by H. Bassom, to $\frac{3}{4}$-in. scale shows good workmanship, especially in the copper boiler. By the same constructor was a 15-c.c. o.h.v. petrol motor of the same high order.

An "OO"-gauge layout with examples of rolling stock too numerous to mention, formed an attractive feature along one wall; and over against the opposite wall was a fully operational "O"-gauge layout. The locomotives were mostly proprietary articles, but the rolling stock was the work of some of the members.

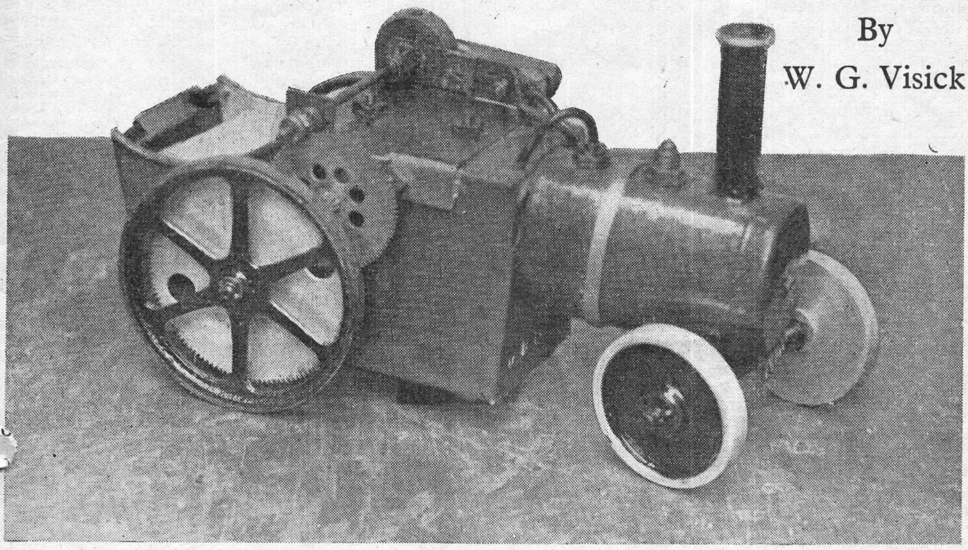
On the centre tables was a display of historical models of early machine tools; viz., the boring machine of 1776, with a very modern arrangement of the cutters, a tribute to the designer Wilkinson. Another boring machine of 1661 vintage was very interesting, if only for the fact that it was set up for boring wooden drainpipes, as used in the old City of London. The year 1569 was represented by a model of the first screw cutting machine, rope and weight operated and displaying great ingenuity. Then there was the [illegible]3 Nasmyth surface grinder, with segmental wheel; please note, those who dismiss history as bunk.

The Chelmsford and District Society of Model Engineers loaned several fine models, among which were the Motor Yacht *Firefly*, the destroyer *Hornet*, and the tug *Wasp*, all by L. C. H. Sills.

The secretary of the Billericay Society of Model Makers, and the organisers of this exhibition, themselves keen model makers, were ably assisted by Messrs. Young, Victor Sutton, and P. R. Richmond to do all the hard graft to make this exhibition worthy of anyone's time to visit, enjoy, and come away instructed. Congratulations, Billericay, we shall be hearing more from you.

A Toy Traction Engine

By
W. G. Visick



HERE is a description of a toy traction engine I have made for my boy for Christmas, and I hope it may be of some interest to others situated as I am, the possessor of a saw, drill and soldering-iron, being a newcomer to THE MODEL ENGINEER, and having a small son who, like myself, is a great admirer of the wonderful models of traction engines which appear in these pages from time to time. I am glad to say, it goes remarkably well, much to my surprise, as I did not think the small engine would develop enough power. But I had to try to do something in these days of acute shortage of toys, and someone may be in the same boat as myself.

Boiler

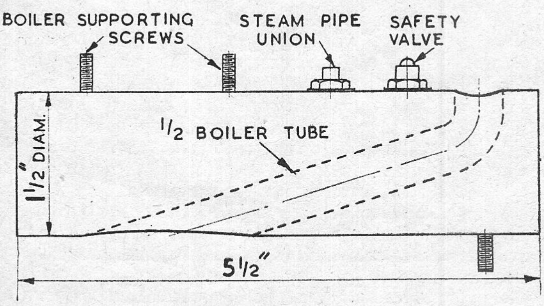
Length: 5½ in. by 1½ in. copper tube, with ½-in. copper tube through the centre, as in diagram. This is intended to increase efficiency—whether it does must be left to the opinion of the more learned, I wouldn't know! On it are fixed screwed rod to act as pivot for front axle, two for supporting boiler, safety-valve-cum-filler and union for steam pipe, which is taken down through the flame and then to the engine.

Three inches of the boiler are subjected to the flame, and the rest covered with asbestos and then tin-plate. A stack, made of tin rolled on a round file and with a brass ring at the top, is soldered to this casing and the exhaust is led through it. A brass band round the casing, number plates, a small piece of brass wire bent at right-angles, and Meccano lamps add to what "reality" there is.

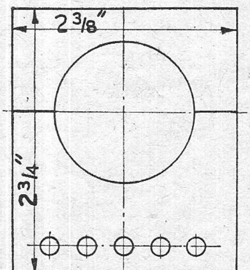
Engine

Single-acting oscillating, with brass flywheel 1 in. diameter and a bare ½ in. wide (apparently it was originally sold to us with a boat).

The engine and boiler are fixed to a stout piece of brass, 3 in. long and 3¼ in. wide, the

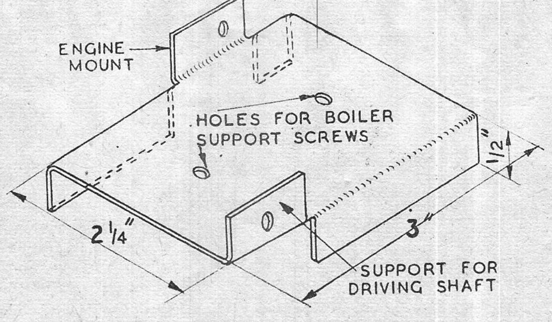


Details of boiler



Tender front

sides being bent as follows: Lines ½ in. from each edge were made along the length of 3 in., a piece ½ in. long was bent up at one end through which a suitable hole was bored to take the end of driving-shaft, and the rest of that side bent down at right-angles; a suitable part of the other side was bent up on which to fix the engine, and the rest of that side bent down at right-angles. This piece of brass then forms the top of the "firebox" and is 2¼ in. wide. The appropriate holes were bored to take the two screwed rods to fasten and support the boiler. The diagram may make this explanation clearer.



Brass top

The sides of the tender were made of biscuit-tin, and are 5 in. long at the bottom and 2¾ in. deep, with a piece ½ in. wide bent in at right-angle on which to rest the lamp. These sides are fastened inside the "bent-down" parts of the brass top. A strip ½ in. wide was soldered across the bottom to take the hinge for the back of the tender, which is hinged to gain access to the lamp. The front of the tender was made in two parts, the top being securely soldered and the bottom being easily removed in case the boiler has to come out. The whole of the inside of the tender is lined with asbestos.

Wheels

The wheels are a lot "picked up" from various places. Front wheels, which are of aluminium, were bought from Woolworth's and are 1¾ in. diameter. The back wheels are 3-in. brass, and came from an old arc-lamp; the gear wheels are from clockwork mechanisms, the first on the driving shaft being ⅜ in., driving 1¼ in., with ¼-in. gear in centre, which drives a gear 2½ in. fastened to the road-wheel. The drive is on this one wheel only. The gears are mounted on a strip of flat curtain-rod, *ex* Woolworth's; this also takes the axle, and there is a similar piece the other side. Both these are screwed to the outside of the "bent down" piece of the brass top. The axle goes through the tender.

The lamp is of the sump variety, and there are three wicks contained in holders made of "30 cartridge-cases; two wicks will work just as well, the third being put in in the hope of improving performance.

The boiler is too heavy owing to the extremely liberal application of Sifbronze at the local garage; it was intended for the various screws, etc., on the boiler to be brazed in, but it was feared they would be lost in the process. The copper boiler-ends are invisible, being covered with Sifbronze.

The completed engine weighs 2¾ lb., will steam for half-an-hour at a satisfactory speed, and will pull a trailer weighing 1½ lb. on linoleum, or on a cement courtyard, the boiler and lamp being completely filled at the start.

Time taken, two weeks, in evenings.

Radio Control of Models

Meeting to be held in Manchester

FOLLOWING a discussion between Manchester and district members of the R.S.G.B. Radio Control of Models Group, it has been decided that a meeting, to which all persons in the North of England interested in the radio control of models shall be invited, be held on Saturday, December 21st, 1946, at 3 p.m., in the Y.M.C.A. (No. 2 Committee Room), Peter Street, Manchester.

The meeting will be open to all persons from all parts of the North of England, who are interested in any way in the radio control of models, whether they be race cars, launches, ships or aircraft, etc.

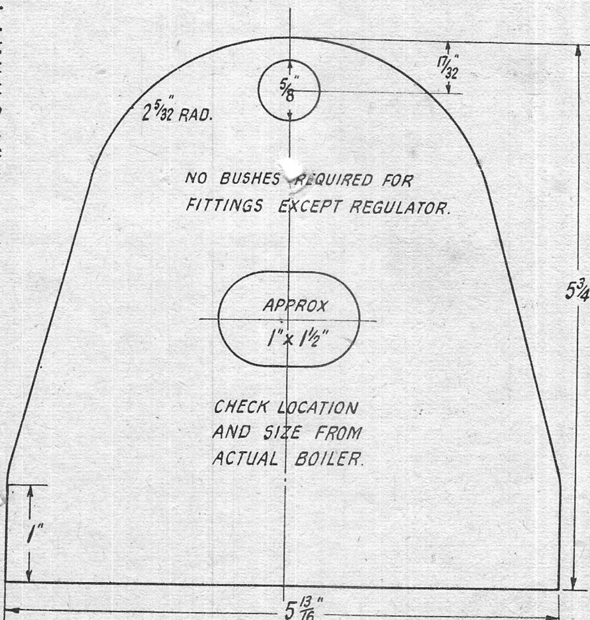
It is hoped this meeting will result in a scheme being developed which will bring about the closer working together of these various radio control enthusiasts. The exchange of ideas and experiences will be the main topic of the day, but the prospects of contests for this particular part of model work will also be discussed, as it is felt that this is a very suitable way of encouraging the development of the work.

All interested who require further information before the meeting should write to either of the following persons:—Mr. D. Gordon Bagg, 26, Priestnall Road, Heaton Mersey, Stockport, Cheshire; or Mr. R. Lawton, 10, Dalton Avenue, Whitefield, near Manchester. (WHItfield 2781.)

"Hielan' Lassie" By "L.B.S.C."

Alternative Boiler Shell

AT the time of writing, I am getting large-sized tales of woe from all quarters, various "Lassie" builders complaining that they cannot get any 4½-in. diameter copper tube for the boiler barrel. On making enquiries from some of our advertisers, they say the wholesalers are out of stock, and one in particular says that the earliest promise of delivery he has so far received, is six months ahead! The blame is placed on the export craze, the demand for copper tubes in manufacturing industries, and various other contributory factors; but whatever the cause, the fact remains that the tube is not forthcoming. The only thing for builders who have completed the chassis and wish to carry on right away, is to seek alternatives. The most satisfactory one is to build up the barrel and firebox wrapper from a sheet of 3/32-in. copper, making the whole lot in one piece, in a manner somewhat similar to the method described for the combustion chamber and firebox. This is easy enough to mark-out. Set out on the sheet of copper, the outline of the wrapper as given with the first boiler instalment; and at the front end, add a section 1⅞ in. long, and 14½ in. wide, cutting the whole lot out in one piece. First, bend as described for the wrapper, then continue bending the front projection into a complete circle with about ⅜-in. overlap. Put some 3/32-in. copper rivets along the seam, at about ½-in. centres. Coax the barrel part into a true circle, then fit the throatplate exactly as described for the combined tube-and-sheet boiler shell as first described. After brazing in the throat - plate — there won't be any upper semi-circular butt-jointed seam to do in this case—lay the shell on its back in the brazing-pan, and go along the seam under the barrel starting from the smokebox end. A taste of coarse-grade silver-solder, if applied before the spelter, will sweat clean through the seam, and the



Backhead for "Hielan' Lassie's" boiler

finished job will be as good as one with a barrel made from tube.

Some readers have asked if they can use different sizes and gauges of tube, such as the 4⅜-in. by 16-gauge specified for "Maisie's" boiler. This can be done within reasonable limits. A 4⅜ in. by 16-gauge seamless copper tube will stand 80 lb. working pressure, and this will be enough to permit the "Lassie" to astonish the natives. The upper part of the firebox and combustion-chamber might have to be made a shade smaller, to maintain the given clearance between shell and "innards," and the given thickness of sheet material should be adhered to; otherwise there is nothing to fret about. If a piece of larger tube is available, it can be used, with the firebox and combustion-chamber as given. The chimney and dome might be a little flatter, to keep to the load gauge.

Steel, or a combination of steel and copper, have been suggested, but I wouldn't advise a steel boiler unless it was Sifbronzed throughout, and then heavily tinned, or else close-riveted with steel rivets and then galvanised inside and out. It is fatal to use galvanising in conjunction with copper tubes, or brass brazing, as the copper and zinc combination would turn the boiler into an electric battery, and pitting, corrosion and finally rotting, would follow. Personally, I'd rather wait until there are supplies of copper available.

Backhead and Foundation Ring

Anyway, for those who have the material, the next job is to fit in the backhead and foundation ring. An outline of the backhead is given here; the only bush necessary, is the one for the regulator gland, as the ⅛-in. metal is thick enough for the fittings to be screwed directly into it. Lay the former on a piece of ⅛-in. or 10-gauge sheet copper, and scratch a line all around, except at bottom, about 5/16 in. away. This is cut out—you'll have to saw it, and trim any

irregularity with a coarse-cut file—then annealed and flanged as described for the other plates. Beginners will be pleased to find that flanging $\frac{1}{8}$-in. material is no more difficult than the thinner sizes. When finished, don't forget to go over the flange with a file. The hole for the regulator bush is $\frac{5}{8}$ in. diameter; first drill a small hole, $\frac{1}{8}$ in. or $\frac{3}{16}$ in., at 17/32 in. below top of flange, measured at the bend; the flange isn't at right angles to the plate at the top, owing to the backhead sloping when in the boiler shell. Open out the hole with a $\frac{5}{8}$-in. drill; or if you haven't one, use the biggest available, and file to size. The hole doesn't go straight through, but on an angle, which you need not bother about until the backhead is fitted into the boiler shell. The exact angle can then very easily be seen.

Measure the distance from the inside of the top and sides of the wrapper, to the top and sides of the firehole ring; transfer the measurements to the backhead, mark out the location of the hole, getting the exact size and shape from the lip of the ring itself, then cut out the piece. Leave it a little undersize at first, then offer "up" the backhead, as the shopmen would say, and see how the hole matches up with the lip of the ring. If any correction is needed, you can see at a glance, exactly which side, or top or bottom. File the hole to correct size and location, insert the backhead in position, with the lip sticking through the hole, then beat down the lip, outwards, same as on the inner firebox. If a piece of iron bar is placed horizontally in the bench vice, and the boiler placed over it, with the inside of the ring resting on the bar, it will provide adequate support whilst the beating-down is in progress. Don't forget that lip and edge of ring must be well cleaned; and a little wet flux smeared around it before beating down, would assist in the brazing job. No rivets or screws are needed around the wrapper-to-flange joint, merely see that the plate and flange are in close contact all around. If they are not, teach them manners by aid of the before-mentioned carpenter's mallet.

The foundation-ring is an easy job, being merely three pieces of $\frac{1}{4}$-in. square copper rod inserted between the firebox sides and wrapper, and the end of firebox and the backhead. Fit the latter first, making the piece of rod fit tightly between the flanges; put a few 3/32-in. copper rivets clean through the lot, to hold the rod in place, and keep the plates in contact with it. The side pieces are then fitted and secured same way. Don't forget that clean joints are essential. If there are any interstices left at the ends, plug them with slivers or splinters of copper, so that the brazing spelter won't run through and form stalactites inside the water space. Sifbronzers won't need to do that, as Sifbronze doesn't form the thingammies mentioned, it just fills up the cracks without any assistance; in fact, it makes the best job when it has a crack to run into, and fill up.

If you have a $\frac{5}{8}$-in. parallel reamer, poke it into the hole for the regulator bush, and whilst turning it with a tap-wrench on the shank, force it down so that it lies parallel with the boiler barrel. The bush can then be turned up from a bit of $\frac{7}{8}$-in. thick tube, or copper or bronze rod. *Don't use brass*, or in all probability you will find, when brazing in the backhead, that it has performed the ghost act, and vanished. The actual turning is just a kiddy's practice job; chuck the rod in three-jaw, face the end, turn down $\frac{3}{16}$ in. length to a tight fit in the hole in the back-head, and part off to leave a flange $\frac{1}{8}$ in. in thickness. Reverse in chuck, centre, drill a $\frac{1}{8}$-in. pilot hole, open out to 29/64 in., and tap $\frac{1}{2}$ in. by 32, or 26. Slightly countersink the end, skim off any burring, and fit the bush to the hole in the backhead, as shown in the longitudinal section. Drill the holes on top of the barrel for dome and safety-valve bushes; make the bushes, as described above, to the sizes given on the drawing mentioned, and fit them. We are then ready for the final braze-up.

"Juliet"

Cylinders

These cylinders are of exceedingly simple pattern, being merely the old type of stationary-engine cylinder plus a flange at top and bottom of the port block, for attachment to the locomotive frames. The drawings are self-explanatory, and can be understood by the rawest of tyros and novices. The cylinder castings are machined up pretty much the same as described for the "Lassie" and other outside-cylinder engines in this series. Clean up the port-face roughly with a file, and mount the casting, port-face down, on an angle-plate attached to the face-plate, with a bar across the back of the casting, held down by a bolt at each end. Set the bore of the cylinder parallel with the lathe bed, and the core-hole running truly, then with a round-nose tool crosswise in the rest, face off the flange. Next, with an ordinary boring tool, bore out the core-hole as described for the "Lassie," taking out a good "bite" for first cut, to remove the skin. If you have a 1-in. parallel reamer, bore until the "lead" at the end of it will just enter the hole; then ream as per "Lassie" instructions. If your lathe isn't big enough to let the reamer go well through, remove the casting from lathe to bench vice, and put the reamer carefully through with a big tap-wrench clamped on the shank. If you haven't a reamer, bore out to 1-in. diameter, and take a couple of traverses through the bore *without shifting the cross-slide*. This will make up for any springing of the tool. Use the self-act, if your lathe is a screw-cutting one; if it only has a plain slide-rest, I described fully, how to adjust this for perfect truth, a little while back. Briefly, put a piece of brass rod about 3 in. long, in the three-jaw, take a fine cut over it, and check diameter each end with a "mike" or calipers. If the mike shows an error of less than half-a-thousandth, or if you cannot detect any difference in the feel of the calipers at each end of the cut, the top slide is all right for cylinder boring; if not, adjust and try again.

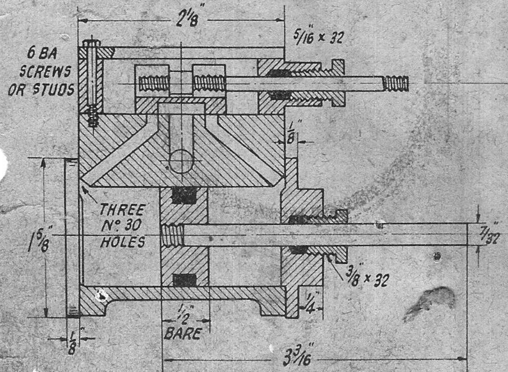
The second flange is turned and faced, with the cylinder mounted on a stub mandrel (bit of

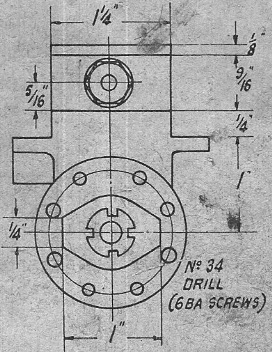
s rod turned to fit bore tightly) held in three-

The port-face is machined off with the der up-ended on the angle-plate, secured bolt through the bore and a big washer each as per "Lassie" instructions. The contact of each flange above and below the port ck, can be cleaned up with a file, unless a ular milling machine is available, in which simply hold the casting in the machine-ce on the miller table, and run it under a suitable side-and-end cutter on the arbor. They could also be done on a planer or shaper, using square-ended tool in the clapper box.

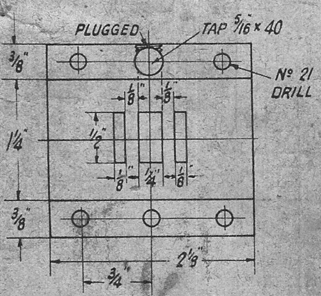
orts and Passages

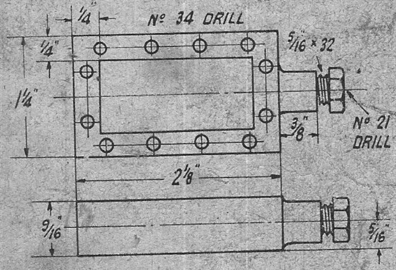
One or two of our advertisers will probably upply cylinder castings with ports cast in; and





Section, end view and portface of "Juliet's" cylinder





Steamchest

if the edges are straight, they need not be touched. The ports in the cylinders for "Bantam Cock" which I am now building (along with old "Grosvenor," the big-wheeled Brighton single, as a parallel job) were clean and true, and needed no attention whatever. These cylinders will only require the three No. 30 holes drilled into the ports from each end flange, as shown in the sectional illustration, plus the bevels filed in the edge of the bore, to allow passage for steam in and out of the cylinders. If the ports are not cast in, mark out and cut them as described for "Lassie." Beginners who have no vertical slide for their lathe, can drill three or four small holes on the marked-out location of each port, and chip them into correct shape by aid of a little chisel, home-made from a bit of $\frac{1}{8}$-in. silver steel. A similar, but larger, chisel with an edge about $\frac{3}{8}$ in. long, does fine for cutting a sharp line along each port edge.

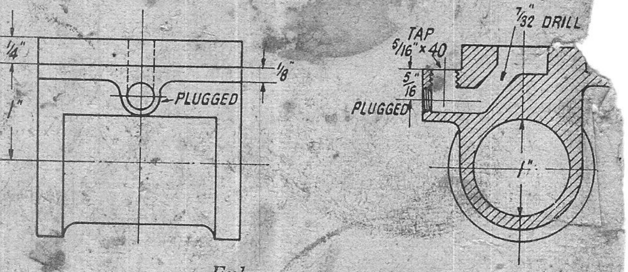
The "entrance to the way out" for exhaust steam is easily made. On the casting, in the middle of one side, you will find the flange extended to form a boss. Centre-pop this, as shown in the plan view of the casting, and drill down $\frac{5}{8}$ in. deep with 7/32-in. drill. Tap the end $\frac{1}{4}$-in. by 40. Now put the drill down into the corner of the exhaust port, and drill diagonally into the previously-mentioned hole; see cross-section. In the middle of the flange, on the side which goes next to frame, centre-pop and drill a 9/32-in. hole, breaking into the first one; tap $\frac{5}{16}$-in. by 40. Put a little screwed plug in the hole in the boss, which need only be two or three threads deep, as it only has to stand the few pounds of exhaust pressure, and file off flush. Run the $\frac{5}{16}$-in. by 40 tap in the side hole again, to remove any burring. Nothing very difficult about that, is there? Drill the five No. 21 screwholes in the flanges, and the worst is over!

Covers and Piston

The front cover is merely a plain disc with a 1/32-in. register projecting from one side, to fit in the bore, and has eight No 34 holes drilled around it, same as the back cover shown, from which measurements can be taken. The back cover needs a little more care. Briefly, chuck by

spigot provided, and turn the register to an exact fit in the cylinder bore, facing it off, also the flange, at the same setting. Then centre and drill 7/32-in. for a depth of about $\frac{1}{2}$ in. Saw off the chucking spigot, and re-chuck, boss outwards, either gripping by the edge in the three-jaw, or else holding the edge in a stepped ring, as described for previous engines in this series. Face off the gland boss, open out to $\frac{5}{16}$ in. depth with 11/32-in. drill (pin-drill if you have one, to ensure piston-rod being dead central) and tap $\frac{3}{8}$-in. by 32 or 40. Make a gland to suit, from $\frac{1}{2}$-in. bronze rod, and ream it 7/32 in. Put four C-spanner nicks in the flange, with a fine flat file or hacksaw. The outside of the boss can be carefully filed to the given shape and size. After drilling the screwholes (and don't forget the two nearest the steam chest should be clear of the passage-ways) put the cover in place, stand the casting with the port-face down, on the lathe bed. Put a try-square beside it, and adjust the cover so that the blade of the square lies against the flat part of the boss; doesn't matter which end. Run a No. 34 drill in one of the screw-holes, making a countersink on the flange; follow with No. 44, tap 6-B.A., and put a screw in. This will hold the cover whilst you make the countersinks for all the rest.

Cut two pieces of 7/32-in. rustless steel or bronze rod, each $3\frac{3}{16}$ in. long, and put $\frac{1}{4}$ in. of 7/32-in. by 40 thread on one end, by aid of a die in tailstock holder. Drawn bronze rod is best for pistons, or castings of different grade of alloy. Dural can also be used, or rustless steel. Rough out to about 1/64 in. over size; then chuck each blank truly in three-jaw. Centre, drill through $\frac{3}{16}$ in., open out to $\frac{1}{4}$ in. depth with No. 3 drill, and tap the rest of the hole 7/32-in. by 40. Put a piston-rod in tail-stock chuck, run up to piston, enter the screwed part, and pull belt by hand until piston rod is right home. For beginners' benefit, may I repeat that this "precision chuck" way of fitting pistons to rods, is the best I know of, from actual experience. They run dead true and never come adrift. Now chuck each piston-rod in a split bush in the three-jaw, as described for "Lassie" pistons, and turn until the piston just slides into the cylinder bore without vestige of shake.



Exhaust passages

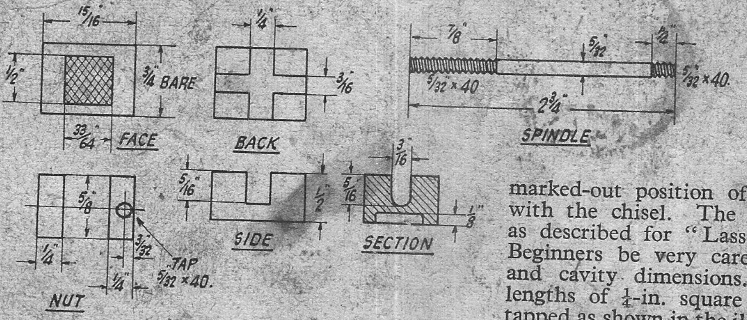
Steam-chests

The rest is plain sailing. The steam-chest can be held in the four-jaw for facing both sides in turn, using a round-nose tool set cross-wise in the rest. The casting can then be rechucked endwise, with the gland boss outwards, in the four-jaw, and the boss set to run truly. Turn the outside of the boss; face, centre, drill right through with No. 21 drill, open out to $\frac{1}{2}$ in. depth with 9/32-in. drill, and tap $\frac{5}{16}$-in. by 32 or 40. Make the gland from $\frac{3}{8}$-in. hexagon bronze rod, and ream it 5/32 in. Screw-holes are drilled as shown. The cover is simply a piece of $\frac{1}{8}$-in. brass, $2\frac{1}{8}$ in. long and $1\frac{1}{4}$ in. wide; clamp it to the steam-chest with a toolmaker's cramp, and poke the drill through the lot. The steam-chest can then be placed in position against the port-face, held with a cramp, and the screw-holes located, drilled, and tapped same as the end covers.

Slide-valves and Spindles

Each slide-valve is made from a block of bronze (bit of drawn bar is best) or a casting. If the latter, the cavity and grooves will probably be cast in; if not, the cavity can be chipped out with the chisel mentioned for cutting ports. Drill a few countersinks $\frac{1}{8}$ in. deep all over the marked-out position of the cavity, and finish with the chisel. The grooves can be milled, as described for "Lassie," or sawn and filed. Beginners be very careful to keep to overall and cavity dimensions. The nuts are $\frac{5}{8}$-in. lengths of $\frac{1}{4}$-in. square brass rod, drilled and tapped as shown in the illustration; the spindles are $2\frac{3}{4}$-in. lengths of rustless steel or bronze rod, one end screwed for $\frac{1}{4}$ in. length, and the other for $\frac{7}{8}$ in. length. The whole cylinder is assembled as shown in the sectional and end views.

Pistons and glands are packed with graphited yarn, as described for previous engines, and cover joints can be made with oiled brown-paper gaskets, cut out with the domestic scissors. There is no need to attach the steam-chests to the cylinders "for keeps" yet, as they have to come off for erection.



Slide-valve, nut and spindle

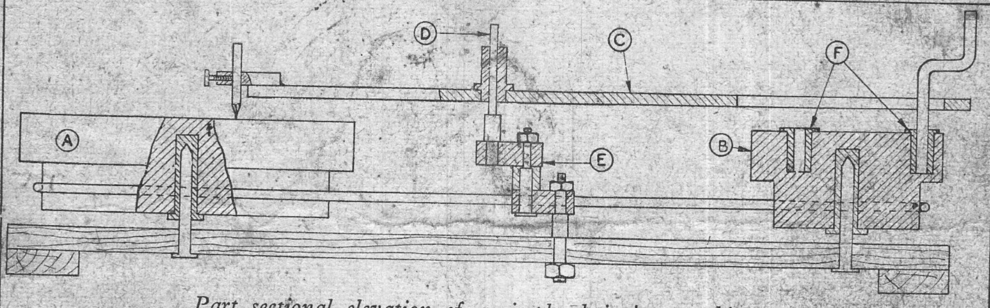
A Simple Designing Machine

By R. E. Matkin

Something for Christmas

WITH Christmas once more nearly upo us, fathers and uncles will again be faced with the hardy annual of providing a supply of toys for the children. I have been acutely aware of this problem for the last six years and have always welcomed hints and suggestions from others. I am still grateful for an article that appeared in THE MODEL ENGINEER about two years ago which described a most ingenious explosive battleship and submarine, and which has given my son considerable enjoyment and the cat much excitement.

This year I thought I could help to ease the problem a little by describing (for want of knowing the proper name) a designing machine.



Part sectional elevation of a simple designing machine

I have always found it a little disconcerting when my lad points out to me the capabilities of Father Christmas with disparaging remarks with regard to my own, especially when I am awakened at 3.45 a.m. on Christmas morning and asked to admire my own efforts. I was startled one year when my boy pointed out that Father Christmas had made all the wheels for his trucks, fire engine and so on out of his set of draughts! Anyhow, isn't it grand fun.

A Fascinating Machine

To get on with the job. If memory serves me right, I got the idea for this gadget from an article I read many years ago, probably in the *Meccano Magazine*. It really is quite a fascinating machine and is capable of producing in endless variety those lovely designs sometimes seen on a pound note—all beautiful whorls and scrolls.

Referring to the drawing, the "works" are mounted on a good strong wooden baseboard, and consists of two wooden drums "A" and "B" driven by a belt made from spring curtain hanger. A pencil is mounted on a length of mild-steel "C" slotted ¼ in. wide at one end for about 4 in. and pivots near the centre by "D." The handle on the small drum is offset and this gives the pencil a reciprocating movement across the face of the large drum "A." The amount of movement is varied by adjusting the centre pivot, which has a universal joint "E," so that it can be placed in any position. A piece of paper is mounted on the large drum, and as the handle is turned so the design is traced.

A Word of Warning

Everything is quite simple and quite straightforward to make, and no one will require any detailed instructions, but a word of warning—everything must be well made and fitted and properly in line, otherwise the machine will fail to deliver the goods, and merely tear the paper.

The drums are fitted with brass bushes to run on steel pivots, which are a press-fit in the baseboard. It will be noticed that the small drum has two bushes pressed in on the top face for the driving handle, in order to give variety to the action of the pencil.

The centre pivot "D" runs in another brass bush pressed into the steel bar and acts not merely as a pivot but keeps the bar horizontal and pencil vertical, which is very necessary. It would be a good idea to have at least two of these bushes about ¾ in. apart to increase the scope of the machine.

I don't think the universal joint needs any explanation—you can easily work out for yourselves which are press fits and which are running fits.

Polish up all the metal work and give the wood a coat or two of bright paint, and don't forget a good supply of paper.

By the way—fix the paper like a jam-pot cover with an elastic band, otherwise you will spend all Christmas morning putting in and taking out the drawing pins. Another hint—coloured pencils add to the attractiveness of the designs.

*Electric I
for Passenge

by "M

THE actual construction of the bogies for "6701" involves nothing out of the ordinary, the accepted principles of "Live Steamer" building being applied. The only thing that may seem strange is the overall length of the bogies!

In general, the bogies have outside frames cut from $\frac{1}{8}$-in. thick mild steel, either $2\frac{1}{4}$ in. or $2\frac{1}{2}$ in. in width, the former, if you can get it, as it saves quite a bit of hacksawing. The top edges of the frames are slightly modified from the prototype, involving less work. The wheels are $3\frac{1}{8}$-in. diameter over treads, which will be found to be a more or less standard size, castings being easily obtainable.

Working leaf springs can be fitted or use made of cast dummy springs housing spiral springs—the former are more realistic and are not difficult to make up, but they do take longer in the making.

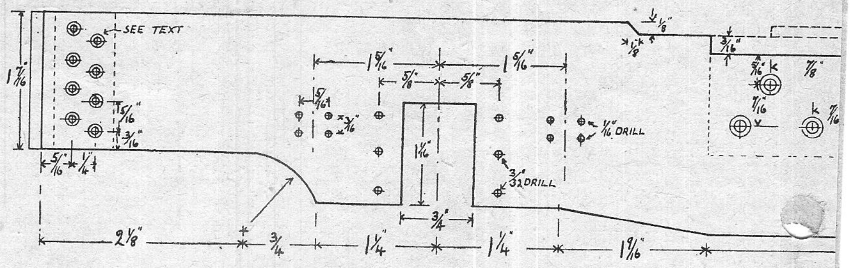


Fig. 6. Main frame (hea

The bogie bolster was a bit of a problem, as nothing suitable was available in the shape of castings. The distance between frames is $4\frac{7}{16}$ in., and all the strain caused in pulling a load is transmitted from the buffer beams, via the frames to the bolster, hence, I felt that something pretty substantial was required.

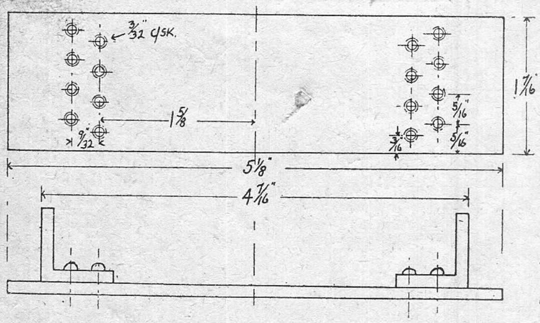


Fig. 7. Inner (or drag) beam

Details for a built-up bolster were got out, but somehow did not look at all right, and no amount of juggling with paper and pencil seemed to improve matters. In the end, it became obvious that only a casting would satisfy all the requirements, and fresh drawings were prepared and through a friend the pattern and castings were made. They are in grey iron and fulfil everything required of them—aesthetic and mechanical! These castings will be available to readers embarking on the construction of the model, and will also suit other electric locomotives having outside framed bogies.

Regarding the details of construction, Fig. 6 is a sort of composite drawing which gives nearly all the details required, the main frames being shown in a heavier line.

Four frames are needed, and the easiest way to get them out is to cut off four pieces of $\frac{1}{8}$-in. × $2\frac{1}{4}$-in. steel to square up to a length of $16\frac{7}{8}$ in. Mark out one of these pieces to the outline shown in Fig. 6, including the holes for the attachment of the end beams, then drill at least two of these holes at each end, 3/32 in.

The procedure now depends on the workshop equipment available. If you possess a drilling machine and miller then you can clamp all four plates together, follow through the holes already drilled in the top plate, unclamp and rivet the four plates together temporarily and then proceed to shape the outlines on the miller.

If you are not so fortunate, then the job can be done as I did mine, in stages. Clamp the marked out and drilled plate to *one* other, drill through and rivet together and then take off your coat and set to with saw and file! When these two frames are complete, part them

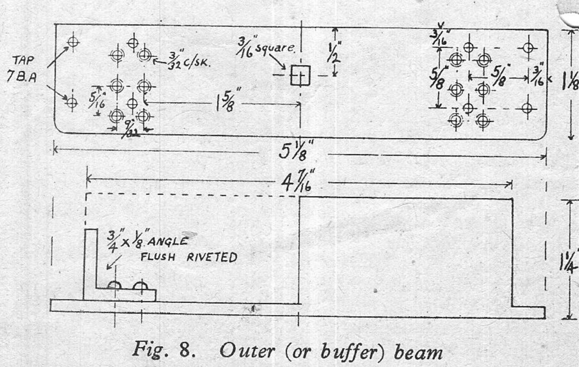


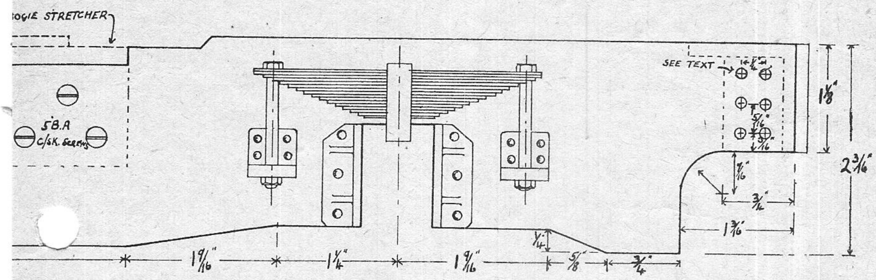
Fig. 8. Outer (or buffer) beam

*Continued from page 358, "M.E.," October 10, 1946.

ocomotives -Hauling—(3)

li-Amp"

and clamp one of them to one of the remaining blanks, mark out the outlines by drawing round the edges of the completed plate with a *sharp* scriber, and spot through the holes for the beams.



utline) and details of bogie

Then repeat the performance, by clamping the marked out plate to the "sole survivor," drill, rivet and shape to outline. Keep the plates in their pairs from now on and there should be no difficulty in aligning the axles and wheels correctly.

So far no mention has been made of the holes to be drilled for the horncheeks. These will depend on the particular castings you are using and the frames should thus be marked out and drilled to suit them. The dimensions given on the drawing are for Bond's $3\frac{1}{2}$-in. gauge Royal Scot tender castings. These clean up to the right sizes, but unless filed up they are not quite the same shape as those on the prototype (Fig. 9).

The holes for the horncheeks and spring hangers are countersunk on the inside of the frames for flush riveting, the former for 3/32-in. iron rivets, and the spring hangers for $\frac{1}{16}$-in. rivets.

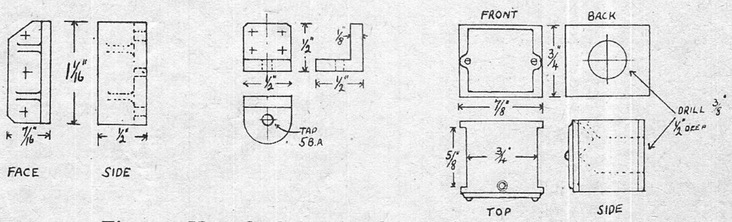


Fig. 9. Horncheeks, spring hanger brackets, and axleboxes

The end beams are shown in Figs. 7 and 8. You can, if you wish, make all four beams alike, though what may be called the inner beams have only one function in the model, that is to space the frames apart, hence a beam made up of angle is hardly necessary. On the prototype these inner beams are coupled together with a massive universal joint, but as this is not incorporated in the model the beam shown will be quite satisfactory.

On the outer—or true buffer beam—the tapped holes for securing the buffers may be left until later and spotted through from the buffers themselves.

Both beams have pieces of $\frac{3}{4}$-in. angle riveted on as shown, for attaching them to the frames. The method adopted in this latter respect depends on the fancies of the builder. Personally, I am dispensing with nuts and bolts, and am riveting the frames, beams and bolsters up solid, as I feel this makes a better job and there should never be any necessity to pull the chassis apart once it is completed. If you decide to use the same method, do not rivet up until everything is ready for final assembly, use nuts and bolts temporarily.

Spring hanger brackets are made from $\frac{1}{2}$-in. × $\frac{1}{2}$-in. × $1\frac{1}{8}$-in. angle, the hole for the spring pins being drilled and tapped out for 5-B.A., and the end rounded with the aid of a jig—as per "L.B.S.C." The jig can be simply a standard washer of a suitable size, case hardened, and will save quite a bit of time in the long run, as there are sixteen of these brackets required.

When you have all the horncheeks and spring brackets ready, clamp them to the frames in their correct positions, drill through a couple of holes in each item and rivet while still clamped. Having got them all "tacked on," so to speak, drill the remaining holes and finish off riveting. To align the horncheeks easily (no marking out required) use a piece of $\frac{5}{8}$-in. × $\frac{1}{2}$-in. bar, put this in the slots in the frame, lay a horncheek each side of it and flush with the bottom of the frames, clamp, drill and rivet as above.

The best way to locate the spring brackets is to scribe a vertical line $\frac{13}{16}$ in. from the edge of the axlebox slots, place a bracket with its edge flush with the line and then by the aid of a rule see that the bottom of the bracket is $\frac{1}{2}$ in. from the bottom edge of the frame, clamp, etc.

(To be continued)

*How to Make

A MINIATURE SMUGGLING LUGGER

By Edgar J. March

DRILL fine vertical holes through ends of all lower yards, and bend all sails to their respective yards with fine thread.

Lower Lug Yards. A rope strop, with eye, was secured round the lower yards about one-third from the fore end, and kept from sliding by two wooden stops nailed to yard. On either side of the stops single blocks were seized to pendants round yard. The traveller and hook can be made of fine wire (Fig. 1) and tye fastened to a shackle through eye of hook; this leads up fore side of mast through a dumb sheave about 18 in. below lower cap and has a luff purchase on end. The single block hooked in eyebolt in deck and fall belayed round cleat aft of purchase (Fig. 7). This

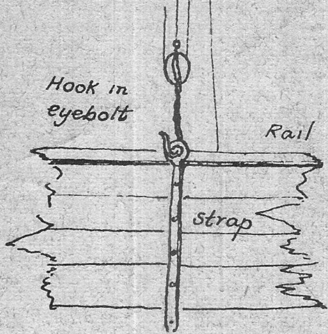


Fig. 6

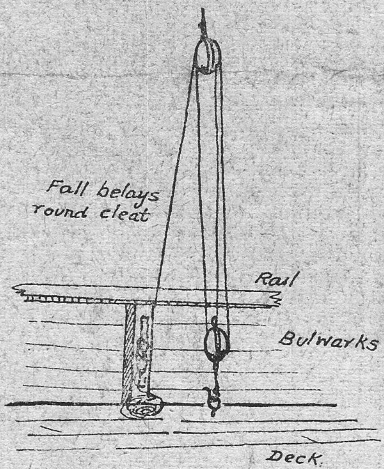


Fig. 7

halyard was changed over to opposite side of deck every time the boat went about, as it was always set up on the weather side.

Peak Halyards 6 *and* 18. In the big luggers peak halyards were generally fitted owing to the great weight of the yards. They led from aft end through sheave in double block at back of upper cap, back through single block seized to yard and through second sheave in double block and down to purchase hooked to deck (Fig. 4).

Fore Tack 8. This went to weather bow and was set up with purchase.

Main Tack 20. This went to the weather side.

Fore and Main Sheets 9 *and* 21. These went to the lee side. Gun or luff purchases were hooked to eyebolts in deck, the double block hooked into cringle in clew of sail, and was unhooked when sail was dipped and the block on opposite side took its place (Fig. 8).

Fore and Main Topsails C and E. Tye of halyard passes through sheave at masthead in similar manner to lower yards, and the purchase hooks to eyebolts in deck abaft lower halyards.

Sheets 11 *and* 23. These led from clew of sail through sheave holes in yard arms and reeve through blocks slung under yards and set up with purchase hooked in deck, fall belaying round cleat at foot of mast.

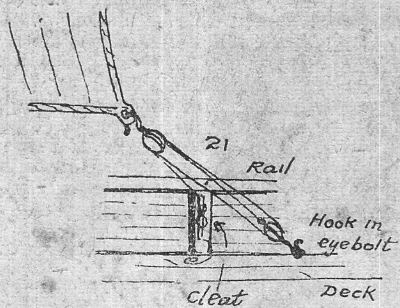


Fig. 8

Tacks 12 *and* 24. These led in similar manner to sheets to cleats fore side of masts.

Clewline 13 *and* 25. Led from clew up to single block seized to underside of yard and down to foot of mast. If these were not fitted downhaul 13a and 25a led from fore end of yard to deck. I cannot be certain if both were fitted together on the one sail, as some prints show one and some another.

Mizen Sail F. This was a standing lug, usually set to port. Tack 30 was hooked to foot of mast, the runner of sheet 29 rove through single block seized to outer end of outrigger and went to purchase hooked to eyebolt on transom and fall

(*Continued on page* 595)

**Continued from page* 559, "*M.E.*," *December* 5, 1946.

PETROL ENGINE TOPICS

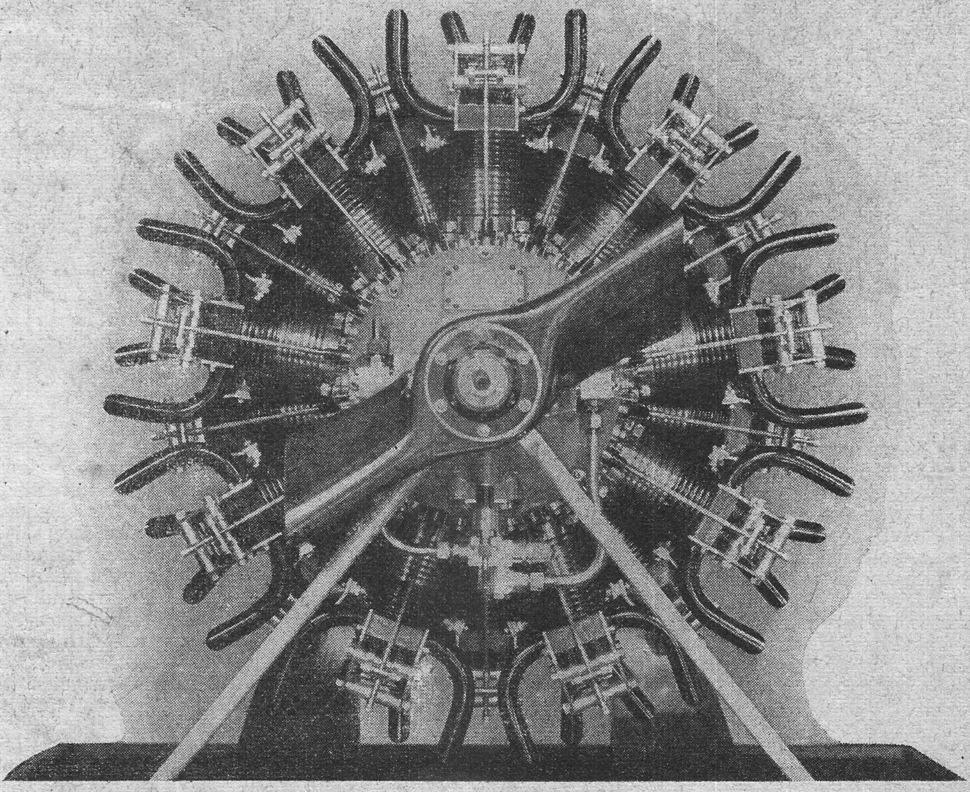
Multi-Cylinder Developments

By Edgar T. Westbury

DURING the many years I have been writing on the subject of model petrol engines it has always been my aim to keep pace, not only with actual developments, but also with really progressive thought in the matter. Many of my readers have had advanced ideas in the design of engines, and have suggested the lines on which model petrol engines should be developed; my own ideas, too, have not been exactly sterile, and so far as advanced design has been compatible with practical possibility, I have done my best to produce engine designs which were fully up to date.

But carrying the banner of progress is liable to be an exhausting business, and I fear that I have never been able to forge ahead quite as quickly as some of my readers would like me to. There are, of course, some people whose favourite hobby is reaching for the moon, and some of the designs they have asked for have not only been beyond heir own powers of practical execution, but also, in some cases, present problems which could only be solved by considerable research work; and it is questionable whether this would be justified by the general interest in the particular line of development. If design were simply a matter of producing a drawing of an engine with advanced and attractive features, it would be quite an easy matter to comply with these demands; but design can only be successful in so far as it keeps in close touch with practice, and avoids the dubious and untried paths as much as possible. I am a believer in progress by evolution rather than by revolution, and evolution is, by its very nature, a slow and tedious process.

Until a few years ago, the reader interested in model petrol engines was generally concerned more with obtaining power and reliability from an engine than anything else, and for this purpose the single-cylinder engine offers the most direct



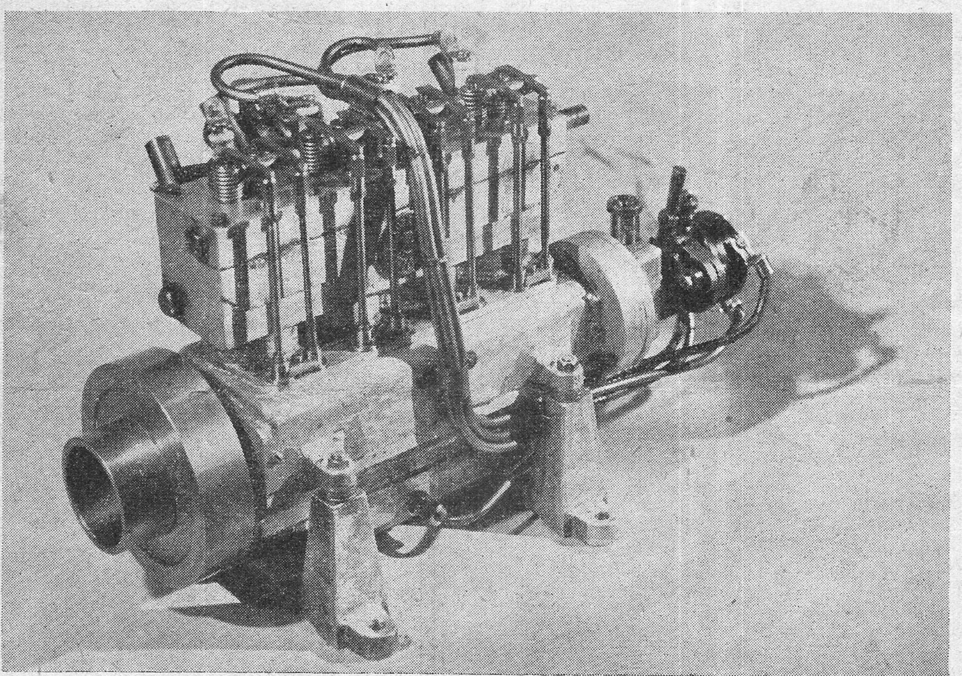
A truly impressive sight—the frontal view of Mr. Gerald Smith's 18-cylinder radial engine

road of approach. It would be idle to suppose that all the problems in the design of the single-cylinder engine have been solved; indeed, it is more correct to say that we have only just touched the fringe of them, but there is at least sufficient data available to enable any model engineer of average ability to construct engines which are reasonably successful and efficient. Some thought may therefore be given to side lines of development which may be more in keeping with advanced ideas in design or more suitable for specific purposes.

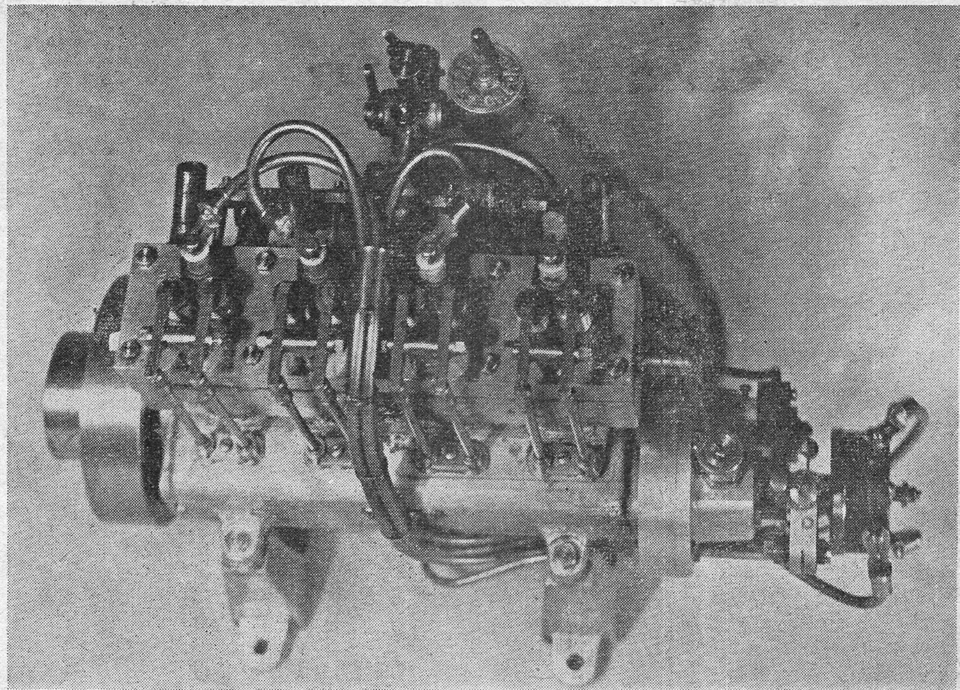
The multi-cylinder engine, which has lately been the subject of many enquiries from readers, is, of course, no new conception among model engineers; its possibilities and problems have been discussed as long as I can remember, but attempts to produce model multi-cylinder engines have been very few—and success in this direction rarer still. I remember, about twenty years ago, a reader stated his intention of building a scale model of a sixteen-cylinder Rolls-Royce engine for a model speed boat, and to keep it within the 30-c.c. limit of capacity! So far as I am aware, however, this was as far as it went, for I have no record of the idea ever having been put into practice. There were, however, one or two really outstanding early achievements in multi-cylinder engines, and among the most noteworthy of which I have any authentic records are those constructed by Mr. D. Stanger as far back as 1908. The first of these was a vee twin, intended for model aircraft propulsion, and this was followed up by a vee four, which was fitted to a model aeroplane which set up a world's record flight of 51 seconds in 1914. These were very large engines according to present model standards, but the fact remains that they were noteworthy pioneer efforts which well deserve a place in model engineering history. It may be of interest to observe that the latest recorded example of Mr. Stanger's activity was a three-in-line two-stroke of some 15 c.c. capacity which appeared at the 1938 MODEL ENGINEER Exhibition.

Mr. Gerald Smith, who is known to many present-day readers as a manufacturer of model petrol engines, was a pioneer in multi-cylinder engine design, his choice being the radial type of engine. A very fine five-cylinder engine of his construction was awarded the Sir Francis Spring prize at the 1924 MODEL ENGINEER Exhibition, and this success was followed up, a few years later, by the eighteen-cylinder radial engine which won the Championship Cup at the 1930 MODEL ENGINEER Exhibition. The latter engine still remains, to the best of my knowledge, the classic example of its type, and the most elaborate model petrol engine ever produced. Its eighteen cylinders are each fitted with four inclined valves and two sparking plugs; full auxiliary equipment includes dry sump lubrication system with dual oil pumps, dual ignition distributors and twin carburettors. Here again, the total capacity of this engine was very large compared with the size of engines now most popular, but in such a complicated engine it would have been extremely difficult, if not impossible, to include full working detail in a very small size of engine.

Several more or less successful attempts have been made to model the type of engine commonly employed in motor cars, which has the advantage of a comparatively simple, or at least straight-



A recent example of the Wall 30-c.c. o.h.v. four-cylinder engine

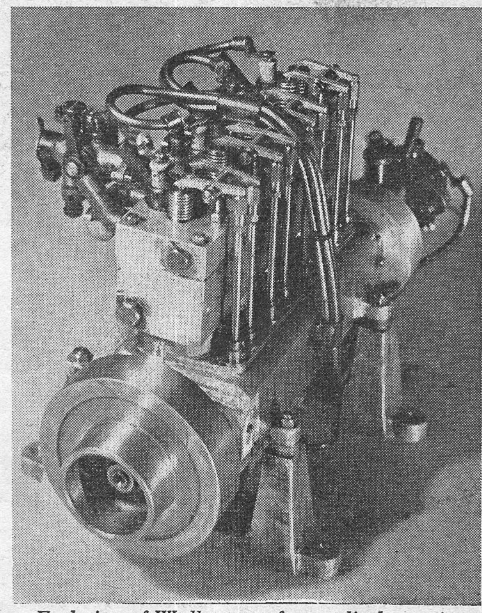


The Wall 30-c.c. four-cylinder engine, viewed from above

forward, layout, in which the number of working parts are kept to the minimum, and machining problems are reduced to their simplest proportions. One of the pioneers in producing a successful model four-cylinder engine was my old friend Mr. Elmer Wall, of Chicago, whose first engine, of 50-c.c. capacity, was described in THE MODEL ENGINEER many years ago, and a later engine, of 30 c.c., with overhead valves, was described during the war. These engines are of very sound and practical design, and many of them have been successfully constructed by amateurs from castings supplied by Mr. Wall. Other interesting and successful engines of more than one cylinder, by the same designer, include a 30-c.c. flat twin four-stroke and a vertical twin two-stroke of similar capacity.

In this country, somewhat similar types of engines have been occasionally produced and I remember a very interesting four-cylinder engine which used to taxi a model seaplane (*avec* live passenger) around Cove Reservoir, Farnborough, though I have no exact details of this engine and do not know who constructed it. The 50-c.c. side-valve engine made by Mr. W. Savage, which has recently been illustrated in my articles on Ignition Equipment, is similar to the original Wall four-cylinder, and enjoys the distinction of being the only small engine of this type with magneto ignition.

My own incursions into the realm of multi-cylinder engines have not, so far, been very spectacular, though, as I have often assured querists, this has not been through lack of interest or neglect of experimental work in this direction. I have considered it discreet to try to find my own way before attempting to direct others in this direction, and the only complete design for an engine having more than one cylinder which has so far been published is the vertical twin engine for the locomotive "1831." This



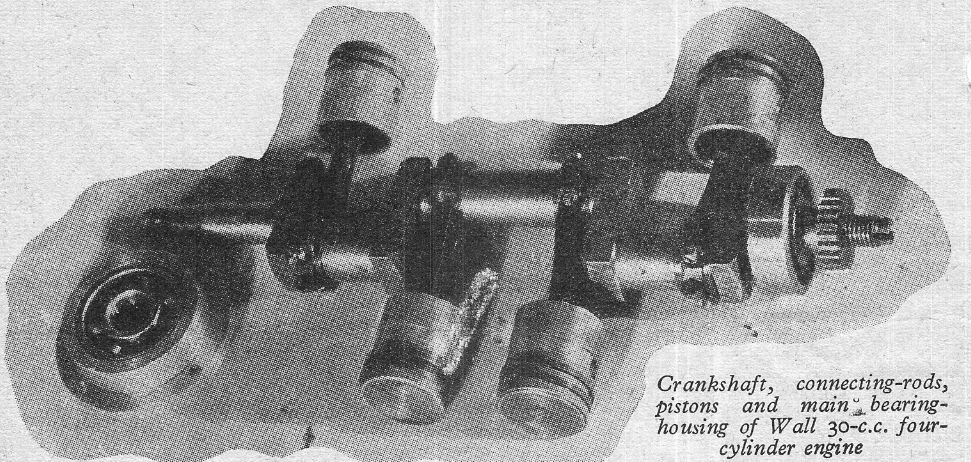
End view of Wall 30-c.c. four-cylinder engine

engine would have been a four-cylinder but for the limitations in the length of the chassis into which it had to be fitted; all that need be said about it at present is that it is a thoroughly successful engine which has been proved quite capable of its intended duty, both in respect of power and control.

Evidence of the increasing practical interest in multi-cylinder engines was provided by the fact that three such engines appeared in the Competition Section of the MODEL ENGINEER Exhibition this year—two of them being of the "straight four" type, a 15-c.c. water-cooled side-valve and a 20-c.c. air-cooled overhead-camshaft engine respectively, and the third a very ingenious and original seven-cylinder radial aircraft engine.

It is an open secret among the initiated that I am now working on a design for a 15-c.c. "straight four" side-valve engine, in the practical execution of which I am being assisted by Messrs. F. Bontor, R. C. Marshall and H. C. W. Frost, all enthusiasts whose achievements are already more than noteworthy. The inanimate carcass of one of these engines, exhibited very unobtrusively on the M.P.B.A. stand at the MODEL ENGINEER Exhibition, attracted so much attention that I wished I had kept it out of the public view until it was completed. For the present, I would prefer only to say that full details of it will be made available to readers as soon as it has reached a sufficiently advanced stage of development to ensure that it will be successful.

I know of other experiments in multi-cylinder engines now in progress, and I trust that I am not betraying any confidences when I state that Mr. D. H. Chaddock is working on something very interesting in this line, the preliminary glimpses of which are most attractive, and I trust that the design will become available in due course.



Crankshaft, connecting-rods, pistons and main bearing-housing of Wall 30-c.c. four-cylinder engine

Dr. Fletcher's Radial Engine

This engine is of special interest, in view of the fact that it embodies some radical departures from conventional practice, including the use of a centrifugal blower for charging. Up to the time the latest news was received, the engine had not been tried out, so it is impossible to say how successfully the new problems introduced by these features have been surmounted; but both in design and execution, the engine has claim to distinction as an outstanding feat of model engineering.

It may be mentioned in passing that Dr. Fletcher has built many types of models, including some excellent prototype boats and at least one locomotive. In the construction of model petrol engines, he has had an able collaborator in his son George, who is to a great extent responsible for the urge to explore new fields of design. After building two or three single-cylinder engines of original design and increasingly successful performance, an experiment was made in the form of a very neat and ingenious vertical twin two-stroke which presented some interesting problems, chiefly in connection with the design of the crankshaft and crankcase; the former was built up in detachable sections for assembly, and the latter was made in four parts bolted together in line. I saw this engine installed in a boat, together with a reversing gear of the Thornycroft type, and I have seen very few neater or more workmanlike power plant installations. Its performance, I have reason to believe, has been consistently successful, except on one occasion when they forgot to fill the petrol tank!

The construction of the radial engine was decided upon after a tremendous amount of discussion regarding ways and means. It was decided that the two-stroke engine offered a fruitful field for experiment in radial engine design, albeit many new problems as well. Crankcase compression is, of course, impracticable in such an engine, as the volume of the crankcase remains constant when several pistons are moving in various directions at the same time. To charge and scavenge the engine, either separate pumping cylinders or a rotary blower would be required, and the latter was decided upon as most convenient, and in keeping with the rest of the design.

The crankcase was made from a casting, and

after the main machining operations were carried out, it was fitted to a spigoted index plate, which in turn was mounted on an angle plate attached to the lathe faceplate for boring the cylinder seatings. In this way it was possible to bore each seating truly radial and square with the shaft centre, and in order to secure the cylinders the seatings were internally screwcut, a gauge being used to ensure uniformity. The cylinders were made from stainless steel tubing, with ports milled out, and passages and flanges brazed on, after which the bores were finished with an expanding carborundum hone to a tolerance of 1/10,000 in. Cooling fins were turned in a duralumin jacket which was screwed on to the cylinder barrel, and the head was secured by 3/32-in. Whitworth screws. Locking rings are fitted to the base of each cylinder to secure it in the correct position.

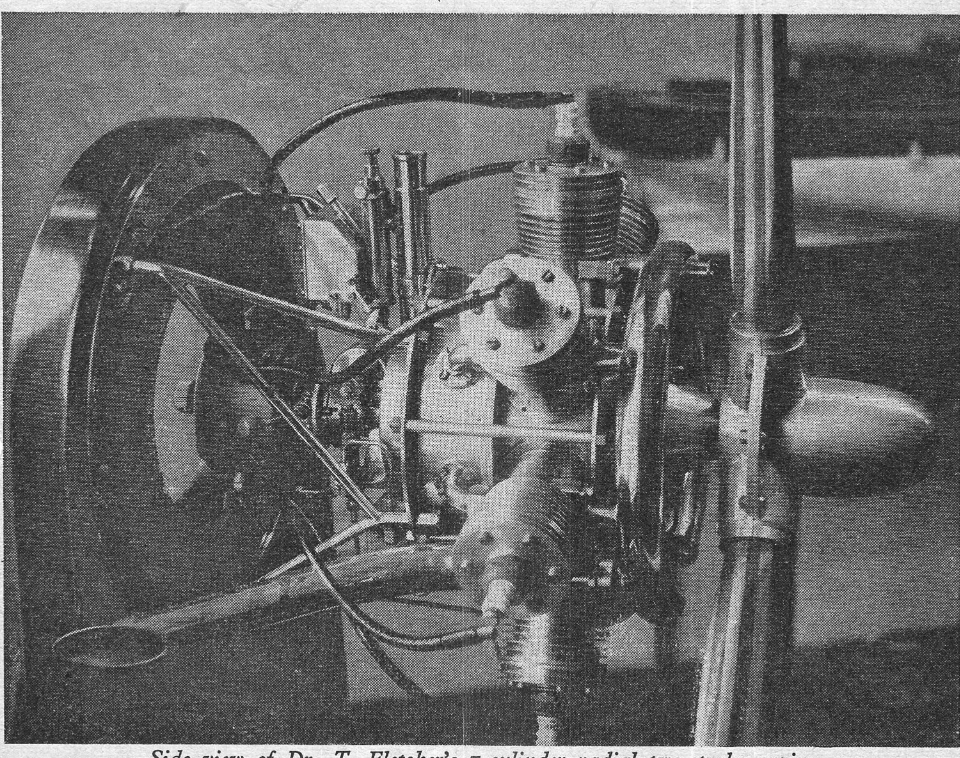
The pistons were turned from centrifugal cast iron, and have no rings. A very interesting method of finishing the pistons was adopted, namely, by using a fine flat carborundum hone held in the tool post between two layers of wood packing; this was brought into contact with the piston and moved backwards and forwards while running the latter at high speed, prior to parting off.

The crankshaft is of the detachable type, having a separate crankpin, which is clamped in the main crank web as in many full-sized radial engines. Connecting-rods also follow full-size practice, consisting of a master rod to which the six other rods are articulated by bushed wrist-pins. This form of assembly introduces some rather peculiar problems in port timing, as the stroke of the pistons varies in relation to crank travel, and it is necessary to allow for this in the timing of the cylinder ports. A long main bearing in the front housing and a shorter one in the rear endplate support the crankshaft, which is hollow, as also is the crankpin, not only to reduce weight but also to convey lubricating oil, which is supplied under pressure, and used oil is returned by a scavenge pump, through a filter and oil cooler housed at the lowest point of the crankcase, into the main oil tank.

The charging blower has a 15-bladed impeller with tapered blades, driven by three sets of epicyclic gearing, giving a step-up of five to one, from the main shaft. Its diameter is $2\frac{1}{8}$ in., thus at 2,000 r.p.m. of the engine, the peripheral velocity of the blade tips is in the region of 70 to 80 miles per hour, and the calculated cubic displacement should be ample for the charging and scavenging of the cylinders.

Ignition equipment includes a low-tension contact breaker with a seven-pointed cam and a high tension distributor, the insulating housing of which was made in vulcanite by methods employed in dental practice. Terminals for the high-tension leads were employed from old wireless valves, and the entire distributor unit is made adjustable

(Continued on page 596.)



Side view of Dr. T. Fletcher's 7-cylinder radial two-stroke engine
(See also the photographs in the September 19th and October 3rd, 1946 issues of the "M.E.")

A 6-c.c. Petrol Engine

Ian Bradley answers some questions

RECENTLY I have received from a correspondent some queries in connection with the 6-c.c. two-stroke, which I described in the issues of THE MODEL ENGINEER for November 26th and December 10th, 1942. It appears there are a number of these engines being built, so, in the general interest, the Editor has kindly consented to my replying to these queries through the medium of these pages.

Query No. 1 concerned the jet and needle valve, and requested a dimensioned sketch, showing how this assembly is made up. The sketch is reproduced herewith (Fig. 1). It shows a section of that portion of the crankcase which forms the carburettor body. If this drawing is read in with the original section in plan (Fig. 2), the layout will, I think, be quite clear.

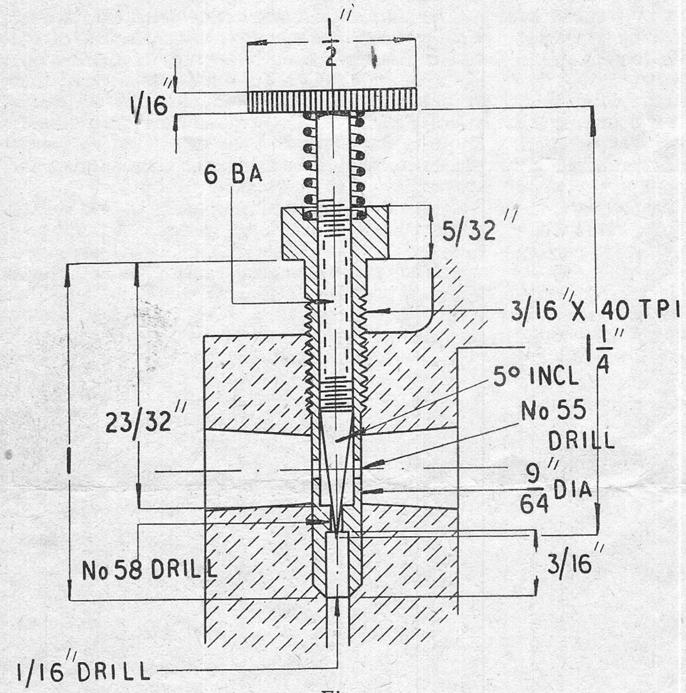


Fig. 1

Query No. 2 asked the size of the three ports, exhaust, transfer, and rotary valve. These are the same as those given for Mr. E. T. Westbury's "Kestrel" engine in 1937, *viz*.:

Exhaust 11/64 in. diameter, three holes.

Transfer ⅛ in. diameter, three holes.

Rotary valve, ¼ in. diameter. See Fig. 3.

Query No. 3 concerned the size of propeller the engine will drive and approximate weight of finished engine. The propeller used for testing was a 12 in. diameter propeller of approximately 6-in. pitch, but the engine was subsequently fitted with a 14-in. diameter propeller of 6-in. pitch, which it drives at about 5,000 r.p.m.

The weight of the engine is 1 lb.

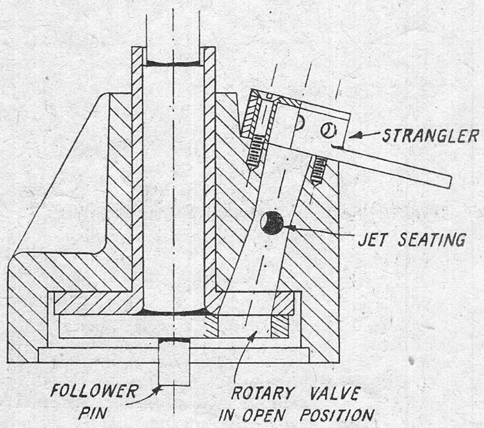


Fig. 2

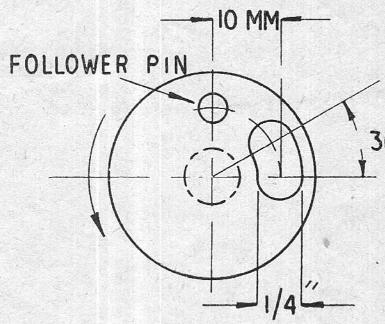
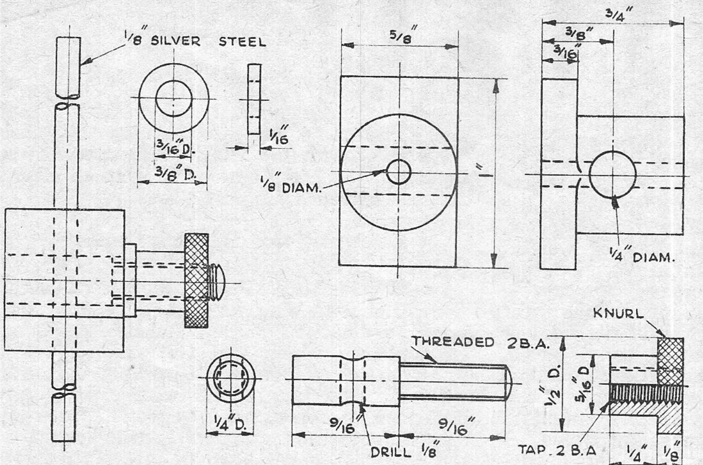


Fig. 3



A Depth Gauge

By A. F. Ware

THE depth gauge described herewith has proved a most useful addition to the tool-box. Being small, it can be used in situations inaccessible to the orthodox long-beam variety. As a length gauge when sawing of stock, a jumping hacksaw does not mean a marred graduated blade; the $\frac{1}{8}$-in. silver-steel rod, if irretrievably damaged, is cheaply replaced.

The body was the head and part of the shank of a $\frac{5}{8}$-in. bolt. I was fortunate in obtaining a scrap stainless-steel aircraft-bolt, but mild-steel will do. It was chucked in the lathe and the protruding head reduced to $\frac{3}{16}$ in. thick. A $\frac{1}{8}$-in. hole was drilled up through the centre for a distance of 1 in. The bolt was removed from the lathe, and two opposite portions of the thinned head were sawn and filed away. This left a base for the tool 1 in. by $\frac{5}{8}$ in. by $\frac{3}{16}$ in.

By holding the bolt in a vee-block, a $\frac{1}{4}$-in. diameter hole to accommodate the draw-bolt was drilled through it. The surplus length was sawn off, leaving the body $\frac{3}{4}$ in. long.

The draw-bolt was next made (in my case of stainless-steel). Its reduced length was threaded 2-B.A. and the larger portion then inserted into the body. A $\frac{1}{8}$-in. drill, following the centre hole already drilled, made the necessary hole in the draw-bolt.

The knurled nut was then undertaken and, together with the washer, threaded on to the draw-bolt.

A 6-in. length of $\frac{1}{8}$-in. silver-steel was pushed into the body and draw-bolt, and the nut tightened. The draw-bolt had been left a shade long in the greater portion and projected from the hole made for it. This unwanted protrusion was filed flush and rounded into the surrounding material.

The sharp corners and edges were radiused-off and the tool finished with fine emery cloth.

A Miniature Smuggling Lugger

(*Continued from page* 588)

belayed round cleat on mast. A ring on spar prevented it falling into water when slackened off. Sail was hauled in by inhaul 29a.

Halyards 28 went from aft through dumb sheave to purchase hooked to starboard. Being a standing lug, halyards were not shifted to weather side when tacking.

Mizen Topsail G. Halyards 31 went from aft through dumb sheave to purchase hooked to starboard.

Sheet 32. Led from clew through sheave end of yard and rove through single block under yard and belayed foot of mast.

Tack 33 went to foot of mast; when this was hauled down and the halyards and sheet slackened off the sail could be kept under control and brought into the boat. Some luggers set the mizen topsail similar to those on main and fore. Bowlines were sometimes set on all topsails, lead as shown in Fig. 2.

Jib A. Tack 4 was hooked to traveller, which was hauled out by outhaul 4a reeving through sheave at end of bowsprit and going inboard via purchase on port side (Fig. 3).

Inhaul 4b was seized to traveller and led inboard through hole in starboard bulwarks and belayed round cleat.

Halyards 2. A single block was seized to head of sail and another to fore side of lower cap. Halyards reeve through these down to purchase set up on deck and fall belays round cleat on fore side of mast.

Sheet 3. Standing end fast to outside of bulwarks, rove through single block at clew and back through hole in bulwarks and belayed round cleat.

Downhaul 5. This led from head and belayed round cleat.

Flag Halyards 39. Led from deck through truck at main and mizen masts.

This about completes the rigging of the model. As a lugger's best point of sailing was reaching, it will be as well to depict her with wind abeam and all sails close hauled; be sure that fore and main lugs are to leeward of masts.

Mount hull on baseboard, listing well over and make sea from gesso and paint in a background of chalk cliffs, etc. A very realistic model could be made by setting both lugger and revenue cutter in one case, with the latter closing in and firing forward gun, smoke being represented by a tiny piece of cotton wool, both vessels carrying every stitch of sail.

Trade Topics

Multicore Solder Packs

THE advantages of cored solders, especially for use in electrical work, are now fully established, and they are rapidly superseding ordinary solder for this purpose. Multicore solder, which contains three cores of special Ersin flux, has hitherto been sold by weight, but is now obtainable packed in a special carton, which contains a specified length of wire, capable of adjustment to meet fluctuations in the prices of raw materials. The solder is in the form of wire, in various gauges from 13 to 18 gauge, and is wound in such a way that it can be pulled out from the centre of the coil, through a hole in the carton, without risk of becoming entangled. A special small-size carton, retailing at 6d., is available for the amateur mechanic and handyman.

The new Multicore solder pack

Multicore solder requires no extra flux beyond that provided by the core; it should be applied simultaneously with the soldering bit, and the non-corrosive Ersin flux ensures a free flow of solder and a clean, permanent joint This product is manufactured by Multicore Solders Ltd., Mellier House, Albermarle Street London, W.1, and is obtainable from all electrical and engineering supply stores.

Soldering and Brazing Clamps

THE ETA ENGINEERING CO., 3, Brackenbury Road, Goldhawk Road, London, W.6, have submitted to us a sample of the Eta Soldering and Brazing Clamp, an appliance which will be found extremely useful in many light metal-working operations where it is necessary to hold two pieces in correct juxtaposition, sometimes at very awkward angles. As will be seen, it incorporates a holder, with a rod bent at right-angles at one end, which carries two universally-adjustable clamps. The method of use will be self-evident from the illustration and it will be clear that it supersedes wiring or other cumbersome means of fastening parts in position for soldering or brazing.

The Eta soldering and brazing clamp

Petrol Engine Topics

(*Continued from page* 593)

for advancing or retarding the ignition timing. The oil pumps for pressure and scavenge are driven by spiral gears at a ratio of $12\frac{1}{2}$ to 1 reduction from the main shaft.

A carburettor on the principle of the Claudel-Hobson aircraft type is fitted, having a float chamber with a balsa float, a main and slow running jet, air-bled diffuser, and a hollow disc throttle valve. The petrol tank is of aerofoil section, built up in copper and brazed. Induction pipes are also of copper, bent by filling with type metal and rolling round a grooved pulley of the required radius. A similar method was used for forming the exhaust ring, though the latter is of larger diameter. Oil pipes were drawn down through a series of dies, from $\frac{1}{8}$ in. to $\frac{1}{16}$ in. diameter, as the latter size was not available at the time.

The variable-pitch airscrew is not the least interesting component of the engine. It has laminated blades, each screwed at the root into a brass thimble, having a collar at the base, which fits closely in an annular groove inside the hub, the latter being made in halves and bolted together, thus preventing the blades being thrown out by centrifugal force. The airscrew is 22 in. diameter, and the normal pitch is 16 in., which can be varied by setting the blades, which are statically and dynamically balanced as separate units, the entire assembly being tested for balance afterwards.

Letters

Winch and Capstan

DEAR SIR,—I was very interested in the above article, by Mr. J. E. Jones, on page 88, Vol. 95, No. 2359, July 25th, 1946, issue, as I was an apprentice to the firm of Messrs. Harfield and Co. Ltd., of Blaydon-on-Tyne, during the years 1908 to 1914. I remember seeing the several models they had in the manager's office. This firm also had offices in London, the model may have come from either place.

The photograph in question shows a type I do not remember seeing made, and think it must be one that was made before 1908. The type that was being made during my time was a greatly improved one, with a special brake for allowing the anchor to run freely when paying-out.

This firm went out of business sometime during the years 1919-23. I came out to India after the last war, in 1919, and on my first leave home in 1923, found that my old firm had disappeared.

If Mr. Jones would like to sell this model any time, I would be only too willing to try.

Yours faithfully,

Dikom, Assam. R. MACDONALD.

Neglected Locomotives

DEAR SIR,—Notwithstanding the inevitable march of progress, one could not help feeling a pang of regret at the recent announcement of the new wholesale electrification scheme of the Eastern section of the Southern Railway, and the foreshadowing of its extension later to the Western section as well.

For a lover of the steam locomotive, it was depressing to read that "steam trains" will, before long, be excluded from all the London termini of the Southern Railway, except Waterloo.

One begins to wonder now, whether the unsightly appearance of the Southern Pacifics, which our friend "L.B.S.C." so aptly describes as "biscuit boxes," is not the product of a mind so ultra-electric in its outlook as to wish to cover up, or camouflage, such steam units as *must* be built, by making them look as nearly like an electric locomotive as possible, as if ashamed at having to build them at all!

The lay press, too, seem to be doing all they can to discredit steam, for their comments so often contain unfair comparisons, as for instance, when we are told that the work of 1,000 steam locomotives is to be taken over (in the new Southern electrification) by 150 diesel, and 200 electric engines, with some multiple units, thus implying that steam is hopelessly outclassed.

But electricity enthusiasts and the lay press are not the only enemies our old and faithful friend, the steam locomotive, has to contend with, for there is the "enemy within the gate,"

Those whose duty it is to care for the engines seem to have lost all pride in their charges, with the result that even those superb steeds of the iron road, our main line express engines, are more often than not covered in grime and filth, so that even the numbers are sometimes almost illegible. I have seen cases where the numbers have actually had to be scribbled on cab-side sheets or buffers-beams in chalk!

It is heartrending to note the efforts made at Swindon, for instance, to inspire pride by turning new engines out in all the glory of polished brass and copper, with beautiful painting and lining, only to see the same engines a few weeks later, with all their glory covered in universal black!

"War time" is no longer an excuse, and I am told that running shed staffs were never more numerous than today, so what is the reason?

Is it just one more illustration of the deadening effect of the depersonalisation of industry?

Yours faithfully,

Aldermaston. A. E. NEWBERY.

Jet-Propulsion

DEAR SIR,—I noticed in a recent copy of THE MODEL ENGINEER an article describing a so-called jet-propelled ship model.

The steam jet operated into a type of ejector apparatus which imparted a velocity to a column of air, and the column of air was delivered beneath the water at the stern of the boat.

The principle of jet propulsion is the reaction, produced on the jet generating plant by the change in momentum of the medium. In the case of a steam jet the maximum reaction will be obtained by obstructing the steam as little as possible on the atmospheric side of the jet, and thus getting the maximum velocity of steam, so I see no advantage, but rather the reverse, in getting the steam mixed up with air and water.

Why not have the steam jet directed astern and horizontally about 2 in. above the water? What would be the thrust developed by a steam jet produced from a modern high efficiency flash boiler, with a by-pass operated steam feed pump?

Yours faithfully,

London, S.W. G. L. WALKER.

Model Yarrow-Type Boiler

DEAR SIR,—With reference to Mr. Richards's enquiry for data, issue 31-10-46, Model Yarrow-type Boiler, I would recommend a large number of small tubes, rather than a small bank of large. The whole success of these boilers depends on the rapid steam raising due to the enormous number of tubes, running into thousands in some cases, and most of the tubes I have seen are round about $\frac{3}{4}$ in. and 1 in.

I would suggest a steam drum $2\frac{1}{2}$ in. $\times$ 8 in., 16-gauge, and dished ends 13-gauge; for seatings I would use some thick-walled $\frac{1}{2}$-in. tube, copper, which the railways use. Mud drums 1 in. $\times$ 9 in., ends turned from $\frac{1}{8}$-in. copper, downcorners $\frac{1}{2}$ in., cut to suitable length and curved so that they are outside the casing. When the boiler is complete, tubes $\frac{1}{4}$ in. $\times$ $4\frac{1}{2}$ in. three rows, each side, as many as can be accommodated allowing for a reasonable spacing of $\frac{1}{4}$ in.; tubes to be staggered.

As to the brazing of this job, I'd suggest that the steam drum be tackled first; then the ends and nipples; and finally the mud drums and downcorners. (Note the latter are inserted in the top at one end, hence the extra inch.)

Drill $\frac{1}{4}$-in. holes to suit space, in the mud drums and each side of the steam drum. Now cut tubes and offer up to steam drum and mud drums. (Note all brazing, not silver-solder, so far.)

The assembly can now be wired up with steel wire and the tubes silver-soldered. The ends of downcorners are inserted in the lower end of steam drum, one each side and silver-soldered at same heat.

After this, the casing of blued-steel lagging and lined with $\frac{1}{8}$-in. asbestos. It is usual to have the up-takes one each side in the middle of the bank of tubes. Burner of blowlamp $1\frac{3}{4}$ n. × 5 in. of usual speed-boat type.

As regards steaming, I have reached 250 lb. per sq. in. with a smaller edition, and steamed a 4-cylinder S.A. engine to a standstill, which was reputed to be taking 400 lb. from a flash boiler. (This was afterwards found by actual test to be 25 lb. to 40 lb.) But that is another story. If Mr. Richards cares to write me I will be delighted to help him.

Yours faithfully,

Dublin. E. TRAMP, D.S.M.E.

The "M.E." Exhibition

DEAR SIR,—I was extremely glad to see the article by Mr. J. Ash, on THE MODEL ENGINEER Exhibition. Frankly, I have been rather hoping for some such comments for, speaking for the Society of Model and Experimental Engineers, I am certain that it will enable us to correct our mistakes in future.

I must, however, venture to differ from him on one point—the apportionment of club space. I feel he overlooks the fact that the S.M.E.E. were one of the organisers and sponsors of the Exhibition, and did put in a very great amount of work. That being so, they should, I feel, be entitled to commensurate recognition by way of space. But, leaving all that aside, I wonder if he has examined the position from the point of view of space per member. If he does this, he will, I think, find that, with the possible exception of one club—which incidentally expressed satisfaction with the space allotted to them—the S.M.E.E., far from having ample space, had in fact proportionately less than other societies.

That, to create an ideal exhibition, more club space is required, I entirely agree. But at these exhibitions, space is at a premium, and its allocation must be decided by the managing committee according to many circumstances.

With many of his other criticisms, I would agree entirely. I would only add that in my own view, the absence of certain firms was due to a mistaken idea that the time for the show was not yet ripe. I fancy they are regretting this by now.

Finally, as regards the club stands themselves. This design of stand was undoubtedly faulty. Nevertheless, I feel entitled to point out that the proposed design was laid before representatives of all the participating clubs, including Mr. Ash's club, and had their approval. However we shall know better next time.

Yours truly,

London, W.1. T. W. PINNOCK

Steam Consumption of Turbines

DEAR SIR,—When reading Mr. K. N. Harris's letter in your issue of October 24th, I noticed that he says nothing of the method of producing the superheated steam. It is produced on the combustion of concentrated hydrogen peroxide, and a solution of calcium permanganate. I am afraid I cannot find any data on the amount of steam given off. The pumps the turbine drives are, of course, of the centrifugal type.

Yours faithfully,

Newcastle-on-Tyne. J. W. BEGG.

Clubs

Plymouth and District Society of Model and Experimental Engineers

This society has now been formed and has a membership of over 50. Meetings have been held as follows:—

On Friday, October 18th, 1946, at the Athenaeum, Alexandra Road, Mutley, Plymouth, when Mr. D. Lindsay gave a lecture on "Railway Track Construction." On Friday, November 15th, when Mr. Frank Curtiss, assisted by Messrs. T. M. and A. M. Pape, gave a lecture on "Boat Building."

On December 20th, 1946, a meeting of members will be held at the Athenaeum, Plymouth, when the subject will be "The Internal Combustion Engine."

Hon. Secretary: J. W. MOYSE, 3, Evelyn Place, Plymouth.

The Bristol Society of Model and Experimental Engineers

Our meeting on Thursday, November 7th, held at St. Nicholas Parish Hall, Trinity Place, off Trinity Street, was devoted to a film show. These colour films were kindly loaned to us by the Institution of Civil Engineers, and the subjects were "The Continental Divide Tunnel," and "New York Parkway."

At our meeting on Thursday, November 21st, we had a talk by Mr. H. M. Webb, on "How to Start a Workshop." This is the first talk planned as "Novices Night"; further such talks are in mind.

We shall be pleased to welcome anyone interested in model engineering at our next meeting, December 19th, at St. Nicholas Parish Hall, Trinity Place, off Trinity Street, Old Market.

Hon. Secretary: C. C. LUCY, 28, Bibury Crescent, Henleaze, Bristol.

The Junior Institution of Engineers

Sheffield Section. Thursday, December 12th, at 7 p.m. Metallurgical Club, West Street. Sheffield. Ordinary meeting. "Asbestos, its History, Manufacture and Use," by C. A, Nichols (Member).

Friday, December 13th, at 6.30 p.m. Inaugural meeting of 66th Session, at The Royal Society of Arts, John Adam Street, Adelphi, W.C.2. Sir George Paget Thomson, F.R.S. will present the awards won by members during the past session. Sir George Paget Thomson will then induct Major-General A. W. Sproull, C.B.E., A.C.G.T., B.Sc.(Eng.), M.I.Mech.E., M.I.E.E., as President of the Institution, who will then deliver his presidential address, "Inspection."

Vauxhall Motors Model Engineering Section

Mr. J. C. Crebbin's talk on model locomotives was a great success at our November meeting.

The next meeting will be held on December 17th. Mr. E. T. Westbury will give us a talk on "Model Petrol Engines." We can always be sure of an enjoyable evening with Mr. Westbury on the platform.

Hon. Sec.: JAMES TEMPLE, 15, Felstead Way, Luton, Beds.

The Burnley and District Model Engineer Society

The next meeting will be held on Friday, December 13th, at 7.30 p.m., at the Rechabites Hall, Accrington, Lancs.

Joint Hon. Secs.: J. D. MEE, 2, Windsor Avenue, Church, Accrington, Lancs.; A. BATEY, 36, Moseley Road, Burnley, Lancs.

Croydon Society of Model Engineers

The recent lecture on "Workshop Mathematics," given by Mr. Costar, a member of the club, was well received, and several of the methods of calculation and formulae put forward were new to most, if not all, the members and will be most helpful.

Competition night was held on November 14th, and some excellent models were on show, although the weather no doubt prevented some of the more "vulnerable" exhibits from appearing. Mr. W. Thorne's well-finished "Maisie" was voted as the best and won for its maker the set of bench drill castings generously donated as first prize by the chairman, Mr. Storrar.

Hon. Sec.: L. G. BOOMER, 11, Tritton Avenue, Beddington, Croydon.

Mancunian Model Engineering Society

A last-minute change of plans for the programme of the November 22nd meeting was unavoidable and caused a little confusion, there not having been time to notify members. Films which had been kindly loaned by the Petroleum Film Bureau, augmented by a further selection, brought along by Mr. R. I. Harper, the Eccles Society president, were shown to the members and visitors by Mr. Harper with the aid of his 16-mm. projector and accessories, and were thoroughly enjoyed by all present. Thanks for the success of the show were due to the co-operation between Mr. Harper and our secretary, and were accorded in no uncertain manner.

One of the star turns of the evening, a film taken and produced by Mr. Harper on model activities, was all the more appropriate, in that one of our Whitefield visitors was a star performer, locomotive included. We were unable, however, to screen "New Hobbies," as intended, for the simple reason that this film is a sound film only, no silent version being available. Club secretaries intending availing themselves of films on loan from the Petroleum Film Bureau would be well advised to send for a catalogue of films available and, having chosen suitable films, arrange a date well ahead, bearing in mind that, when details are fixed, the films arrive *rapid*, and after use should be returned by express.

Hon. Sec.: J. MEADOWS, 90, Bank Street, Clayton, Manchester 11.

The North London Ship Model Society

The Society has now obtained the use of a club room at the Union Chapel Club House, 19, Compton Terrace, Highbury, N.1, and a cordial invitation is extended to all ship levers to the meetings, which are held on the first Friday in each month at 7.30 p.m. Full particulars of membership may be obtained from the Hon. Sec., M. E. MOON, 53, Freegrove Road, Holloway, N.7.

Tonbridge and District Model and Experimental Engineering Society

The twenty-sixth meeting of members held on November 7th, 1946, was attended by sixteen members and two visitors.

The main event of the evening was a "Bring and Buy Sale," when members disposed of parts and tools which were surplus to their requirements.

The secretary announced that with regret he would have to relinquish his position at the end of 1946, owing to his impending departure from Tonbridge. It was left to the committee to recommend a successor.

Commencing January, 1947, the monthly meetings will be held on the first Saturday in the month at 3.0 p.m.

Hon. Sec.: A. R. JUDD, 13, Mountfield Park, Tonbridge, Kent.

Glasgow Society of Model Engineers

The second joint meeting with the Stephenson Locomotive Society and the Glasgow & West of Scotland Model Railway Society will be held within the Royal Technical College, George Street, Glasgow, C.2, on Tuesday, December 17th, 1946, at 7.30 p.m., when John W. Smith will give an illustrated talk entitled "St. Rollox in the 'Nineties." The chair will be taken by A. J. Brown, president of the Glasgow Society of Model Engineers. An opportunity for discussion will be given at the conclusion of the talk.

It is hoped that a large general audience may be possible, following upon the success of the first joint meeting.

Hon. Sec.: J. W. SMITH, 785, Dumbarton Road, Glasgow, W.1.

NOTICES

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects, which should be addressed to him at 23, Great Queen Street, London, W.C.2. Matter intended for publication should be clearly written, and should invariably bear the sender's name and address.

Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All correspondence relating to sales of the paper and books to be addressed to THE SALES MANAGER, Percival Marshall and Co. Ltd., 23, Great Queen Street, London, W.C.2.

Correspondence relating to display advertisements to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," 23, Great Queen Street, London, W.C.2.

"THE MODEL ENGINEER"

SALES AND WANTS

Private: **Threepence** *word*. *Trade*: **Sixpence** *word*. *Use of Box* **2/6** *extra*. *Minimum charge*, **3/-**

TOOLS & WORKSHOP

Buck and Ryan's Department for Lathes, Drilling Machines, Grinders, Electric Tools, Chucks, Surface Plates, Lathe Accessories and Tools.—310-312, Euston Road, London, N.W.1. Telephone: EUSton 4661. Hours of Business: 8.30 to 5.0 p.m., Monday to Friday; Saturday, 1.0 p.m.

Split Chucks for Watchmakers' Lathes, 6 mm., 6½ mm., and 8 mm., at 7s. each, postage 6d.—JOHN MORRIS, 64, Clerkenwell Road, London, E.C.1.

Infinitely Variable Speed Gear, ratio 16 : 1, material supplied, leaflets.—CROWTHER, 85, Charlotte St., Rochdale.

"Little John" Lathes. Sole Selling Agents for Home and Export. Send for illustrated literature and orders to—THE ACORN MACHINE TOOL Co. (1936) LTD., 610/614, High Road, Chiswick, London, W.4. Telephone CHIswick 3416-7-8-9.

Selling Up. Straight Shank Drills, H.S.S., Numbers 1 to 60 (only 8 used), 35s.; A to Z Drills (only 6 used). 34s., all guaranteed.—Box No. 4224, MODEL ENGINEER Offices.

Wanted, Bench Milling Machine, Senior, Bonds, or similar. State maker, accessories, dimensions, moderate price, inspected anywhere, 60 miles London, Midlands, or Lancashire.—5, Cadogan Road, Surbiton, Surrey.

Flexispeed Lathe, 1⅝" centre, new, unused, £7 10s.; Adept Shaper, unused, £7; 1½ sets Kittiwake Castings, gears, print, £1 10s.; three Kestrel Engines, require slight attention, plugs, print, £6.—PICKARD, 53, Fairfield Road, Edmonton, N.18.

For Sale, Mechanic's Workshop, consisting of lathe, 3 bench vices, 3 large spring winders, drills, bench tools, and large stock of gramophone repair parts. Old age reason for selling.—WENDLAND, 23, Clerkenwell Road, London, E.C.

Large Stock of Surplus Tools at job prices, any quantity supplied, 1d. S.A.E. for lists.—N. R. BARDWELL, 473, Abbeydale Road, Sheffield.

For Sale, Adept Lathe, stand, treadle, accessories, quantity mechanical electrical apparatus, tools. Callers preferred. Stamp reply.—71, Woodlands Avenue, New Malden.

Wanted, Bench Lathe, 3½", with chucks, tools, etc., good condition essential.—HENDERSON, 21, Maurice Road, Southsea, Hants.

Pitler S.O.S. Will any kindly disposed reader hire or loan for short period (or vend) 5" Pitler Lathe Catalogue, Instruction Book, Screw-cutting Tables or other data to—MAJOR ERNEST L. LEE, 125, Crofton Road, Orpington.

Coles 4½" S.C. Lathe, 18" centres, 3-jaw chuck, 9" faceplate, fitted 4-way turret. Price with countershaft, pulley and belting £30.—AGER, 27, York Road, Ilford, Essex.

Wanted, Watchmaker's Lathe, complete with collets, 6 or 6½ mm. Must be Lorch or Boley. State price and condition to—SIMMET, 7, Berryknowes Road, Glasgow, S.W.2.

Wanted, 3½" Lathe, B.G.S.C. and accessories.—MAWSON, 20, Cross Gate, Mexborough, Yorks.

3⅜" "New Zyto" Bench Lathe, B.G.S.C., tumbler reverse, change wheels, etc., as new, little used, £14.—HARRISON, Manchester Lane, Hartshorne, Burton-on-Trent.

Wanted, Wade 2" or similar lathe. Write particulars.—88, Hugh Road, Coventry.

Engineers' Tools Ex Stock, including Boxed Sets Taps, Dies, in ⅛"-¼", and ⅛"-⅜" M.E.; 0-6 and 0-10 B.A.; ¼"-½" B.S.F. and Whit. Also all seperate sizes. All drill and lathe chucks, including 3" × 3-jaw "Pratt"; Electric bench grinders, tailstock dieholders, etc. All spares and accessories for Myford, Drummond, Atlas, Adept lathes. May we quote you?—TERRY, Fishers Lane, Cold Ash, Newbury.

New Polishing and Grinding Heads, ½" spindle, 6" from base to spindle, bronze bearings, 19s. 6d. each, postage 6d.; new 4" S.C. chucks, complete 2 sets jaws and fixing screws, postage 1s.; sets of number drills, 1-60, H.S. complete with stand, 60s.—H. G. CHALLIS, 4, Crawley Mews, Eversholt Street, Euston, N.W.1.

2" Screwcutting Lathe, Wade, complete, countershaft, accessories, etc., new condition, £16.—Box No. 4237, MODEL ENGINEER Offices.

Wanted, 2" Wade Lathe or similar, B.G.S.C., tools.—17, Harvey Road, Worthing.

MODELS & FITTINGS

Blue Prints or Problems by Return Post. Latest super detail prints are Clipper "Stonehouse," 16s.; Racing Yacht, 14s.; Liner "Stirling Castle," 12s.; Destroyer "Cossack," Tug or Motor Yacht, 8s.; Centre Flue Boiler, 3s. 6d.; Blowlamp, 3s. Enquiries 2½d. stamp.—WILSON MACDUFF & CO. LTD., 5, Victoria Street, London, S.W.1.

J.B.A. Eng. Co. have capacity available for making 2.5 c.c., 15 c.c. 2-stroke Model Aero Engines, standard models or your own drawings, prototypes, model parts, etc. Trade enquiries invited.—54, Broadway Court, Wimbledon. Wim. 2930.

Apex and New Atom Minor (Mr. Westbury's design). Engine castings of DTD 424, the famous alloy as used in Rolls Royce Aero engines, sp. gr. 2.56. Tensile 9 tons, lighter and far stronger than diecast, with most attractive finish. Carburettor castings (described June 14th issue "M.E."), and spiral timing gears for Apex, ball-races, piston rings, miniature plugs, contact and other equipment. Send us your enquiries. Trade also invited.—THE HEADINGLEY MOTOR & ENGINEERING CO. LTD., 8, Otley Road, Leeds.

"Lumec" 9.5 Projector, Precision Machine for workshop construction. Particulars 4d.—RACET DESIGNS, 46, Orchard Way, Chesterfield.

Model Inch Scale Traction Engine, complete and perfect except for boiler, £35 or close offer; No. 4 Stuart-Turner vertical Engine, complete with lubricator, pump, etc., first-class job, £20; new injectors, suit 3½ gauge locomotives, with steam valves and check valves, fully guaranteed, tested, £5 5s. each.—Box No. 4225, MODEL ENGINEER Offices.

Model Steam Roller, complete, in excellent condition, any trial, £25; two only, new double-ended ball-bearing Polishing Motors, single phase, ½ h.p., £7 10s.—41, Uxbridge Road, Slough.

Wanted, for Model Boat Hull, piece of Red Cedar, Yellow Pine, or Deal, 3' 4" × 8½" × 4½", free from knots.—C. A. WHITE, 10a, Reeves Avenue, London, N.W.9.

2½" Gauge Bassett-Lowke 0-6-4 Tank Locomotive and open Truck; 2½" gauge 8-wheel Bogie Passenger Truck; 2½" gauge 4-wheel Passenger Truck; 3½" gauge Rainhill Chassis and parts, etc.; Castings for Stuart-Turner No. 10; Stuart-Turner Compound Launch Engine; Stuart-Turner Sirius Engine; Stuart-Turner Compressor; Ken 15 c.c. Petrol Engine, complete; Vertical Gas Engine; Myford Lathe, motorised, on stand; Winfield Lathe, motorised, on stand; Polishing and Grinding Head; Roller Box (new), ⅝" shank; Drill Grinding attachment; 2 Myford Top Slides, complete; 2 Myford Turret Heads; 2 Relmac Tailstocks; Centec Vertical Milling Head (new); 6 volt Heavy Duty Battery; 2 D.C. Electric Fans; 2 A.C. small fractional Electric Motors.—Box No. 4226, MODEL ENGINEER Offices.

"Juliet," the simplest yet. All castings, materials and sundries. List, stamp.—W. H. HASELGROVE, 1, Queensway, Petts Wood, Kent.

Horizontal Steam Engine, 1" bore, 1" stroke, exhibition finish; also boiler, but no fittings, £5; Ensign Selfix 20 Camera, 4.5 Anast. Compur. Offers over £7; Microscope by Ziess Tesslar, in cabinet, nose piece missing, £1 10s. All above in good condition. Sent carriage paid. Write—Box No. 4227, Mo[illegible] ENGINEER Offices.

Wanted, Stuart-Turner 600 Gas Petrol Engine, or ½ h.p. Vertical Engine in good condition.—WILSON, 2, Croydon Avenue, Liverpool 15.

Make Your Own Models, Cigarette Boxes, etc., in transparent "Perspex." Most colours, any quantity.—47, Stoney Lane, Birmingham 12.

4-4-0 Steam Locomotive and Tender, G.W.R. outline, 10¼" gauge (copper boiler), tubes require attention, otherwise good condition. For quick sale, £160 or near offer, in special strong packing cases and carriage paid. Apply—Box No. 4230, MODEL ENGINEER Offices.

For Sale, 2½", 3½", 5" gauge Locomotives, equipment in these and other gauges, steam stationary plants, power ships. Please write requirements and enclose stamp.—Box No. 4231, MODEL ENGINEER Offices.

For Sale, 5" gauge Sir Sam Fay type coal-fired Engine, £75. Can be inspected.—WALKER, 41, Vicarage Road, Smethwick, Nr. Birmingham.

Sale "OO" Electric Railway, tank locomotive, scale track, buildings, transformer, controller, baseboard, trestles. S.A.E. for list.—23, Greenwood Avenue, Acocks Green, Birmingham 27.

Locomotive, 4-4-0 1" scale 5" gauge passenger-hauling coal-fired "King George Fifth." Price £100 or near offer—PRIOR, 215, Upper Grosvenor Road, Tunbridge Wells.

One Beam Engine, 1¼" str[illegible] price £4 10s.; one vertical Compo[illegible] Engine with pump, 1¼" stroke, price £6 10s.; one coal-fired Steam Boiler, 12" high, 6½" diameter, price £7 10s.—PRIOR, 215, Upper Grosvenor Road, Tunbridge Wells.

For Sale, "OO" gauge Electric Railway, complete inventory on application. What offers?—WILLIS, Laurelhurst, Tenterden, Kent.

Model Wharf Crane, double purchase, engineer built, revolving on imitation stone base, £10.—SMITH, Woodhill Farm, Stoke St. Gregory, Taunton.

1/250 Scale Model "Queen Mary," all metal, steam, brazed boiler, pressure blowlamp, ⅝" × ⅝" engine, usual gauges, pumps, etc., competition winner, about £35. Photograph 1s., plus stamp.—WILSON, 8, Mortlake Crescent, Chester.

2½" Gauge S.R. 4-4-0 Locomotive tender finished, bogie finished, chassis with wheels and coupling rods fitted, cylinders machined and ports cut, inner fire-box silver soldered, boiler and smoke-box tube, £25.—INGREY, West Street, Kings Cliffe, Peterborough.

Unused Stewart Sirius, twin steam, wet sump lubrication, steam gauge, steam cocks, throttle, 6⅛" high, 5¾" long, 5" wide.—SCHOFIELD, 3, Hendford Grove, Yeovil, Somerset.

Finely Constructed Oscillating steam Engine, ⅜" × ½", polished mahogany base, price 27s. 6d.—ANDERSON, 30, Fountainbleau Drive, Dundee.

Wanted, Horizontal or vertical Steam Engine and Boiler, all fittings, single or double cylinder, preferably "Stuart," not exceeding 1" bore, 1½" stroke. Must be excellent condition.—Details, price—HAYWARD, Highfield House, Ketley Bank, Oakengates, Salop.

"Wonder" Petrol Engine, ditto Air Compressor, Patterns, Templates, parts. Best offer.—30, Westlake Avenue, Pound Lane, Pitsea.

Locomotive Type Boiler wanted, 8" to 12" diameter. Particulars to—SHARMAN, 43, Newton Lane, Wigston, Leics.

4 Ft. Fishing Protection Cruiser, almost complete, with drawing; Stuart ble 10 vertical, extra water pump ed; Stuart marine boiler, No. 493, complete, for above; Stuart blowlamp for same. Price £45.—TREADGOLD, 3, Southlands Avenue, Horley, Surrey.

For Sale, 1½" scale model Burrell type, compound Traction Engine, painted and almost complete. Best offer over £60.—WALKER, Stakesby Garage, Whitby, Yorks. Tel. 251.

ELECTRICAL EQUIPMENT

Electradix Bargains include :—

Dynamo and Motor Generator Bargains. G.E.C. double current Dynamos, 6 volts, 5 amps., 600 volts, 80 m.a., ball-bearings, 17 lb., as new, 37s. 6d., carriage paid, 5s. refunded on returned packing case. D.C. Dynamos, 12 volts, 10 amps., £4 10s.; 30 volts, 5 amps., £7 10s.; control box, fitted cut-out and regulator, 21s.; 120 volt, 4/5 amps., D.C. Dynamos, £8 10s.—Below.

Small D.C./D.C. Motor Generators by leading makers for use in Radio Receivers to take the place of H.T. battery, 6 volts input, 110 volts, 15 m.a. output, or 12 volts input, 230 volts, 30 m.a. output, £3 15s., weight only 5½ lb., size 5½" × 3½" × 3½", model finish, ball bearings, 2-comms., 2 separate windings, waterproofed.—Below.

Transformers, 3-K.W. Crypto, 230 volts to 115 volts, 28 amps., £9 10s.; to small Bell Transformers, 230/3/58 volts, 7s. 6d. Transformers for Rewind, W. with stampings, 4½" × 6" × 7½", dings damaged by blitz, weight with maged wire, 65 lb., 45s., carriage extra.—ELECTRADIX, 214, Queenstown Road, London, S.W.8.

Reversing, Locomotive/Model Motor, 12-20 V. D.C., ball-bearing, precision job, powerful. Size 3½" × 1½", with reversing switch, 21s.—47, Weymouth Road, Hayes, Middx.

Sale, Cathode Ray Oscilloscope, 3" tube, complete with time base, 50 C/S—100,000 range. Mains 230 V. operation, £25 or nearest offer. Apply—15, Duke Street, Tavistock, S. Devon.

Wanted, Hand Power Drill, 230 volts, ¼ or ⅜.—POPE, 9, Meadow Avenue, Seaton, Devon.

Sale, Tachometer, 25-30,000 revs., as new, with attachments in box, 6" × 3" × 2". Ideal for model tests. Offers.—R. CLOUGH, C/E.R.A., H.M.L.S.T. 3511, Rosneath, Scotland.

Power Transformers, 170 va, oil filled, input 250 volt, single phase, 50 cycles, 8 output tappings, 230 volt, 1.17 amp., 230 volt, 1.10 amp., 230 volt, 1.03 amp., 230 volt, 0.93 amp., also 16.5 volt, 15.5 volt, 14.5 volt, 13.5 volt at 15.1 amps., £3 10s., including carriage.—Below.

New ex R.A.F. open type, 2 volt, 100 amp. Solenoid Switches, with bracket fixing, 3s. each.—Below.

Rotax 24 V. A.C.-D.C. reversible 0.07 h.p. Electric Motors, fitted with reduction gearbox, auto switch, solenoid brake and overhead clutch, with adjustable setting from 4.25 ft./lb., diameter 3½" × 12", weight 9 lb. Made regardless of cost, now at bargain price, £1 1s., including postage.—Below.

Brand New ex-Gov. Thermostats, steel glass tube type, mounted on S.B.C. double contact lamp base, settings between 40 and 50 C., suitable for fire alarms or warning signal for overheating, 4s. each.—Below.

Best Bargain Yet! Large number of brand new Rotax Dynamotors, 24 v., delivering 95 v., with high amps. Will work on 12 and 6 v. Could possibly be made into welding plant, or as a motor for driving machinery, very powerful. Cost Gov. originally £30, now at a gift, £1 5s. each, including carriage.—EMMS, 26A, Coleherne Mews, Earls Court, S.W.10. Flaxman 4596.

£3 5s. 0d., 8" diameter Exhaust Fans, porthole type, 200/250 volts, 50 cycles, single phase, 1,200 t.p.m., new.—JOHNSON ENGINEERING, 319, Kennington Road, S.E.11.—RELiance 1412/3.

Switch Boxes, ex-Air Ministry, new, containing 16 miniature tumbler switches and 44-way terminal board, beautifully made, 10s. 6d. each, post free.—WIDMER, 47, Boveney Road, London, S.E.23.

GENERAL

Brass Tube, 21 gauge solid drawn 1 15/16" O.D. × 10" approx., 3s., including postage; 7/64" O.D. × 2' 6" nickel Silver Rod, 3s., including postage; ⅛" Stainless Steel Rod, 5d. ft.—GANSELL, 18, Mansfield Road, Ilford, Essex.

Vertical Shaper, rack lever feed, compound slide table 12" × 7", weight 150 lb. Make good miller or drill, perfect, £4; English clock movement, fusee wind, ⅛" plates, running, 6" × 5", £1; Screws and nuts, 2, 4, 6, 8-B.A., countersunk, round, cheese, ⅛"-1", steel, brass, cadmium or bright nickel, 1s. gross, by weight, or offer for 24 lb.; 6 v. Car Dynamo, 15s.; new 4 V. 4 A. Dynamo, R.A.F., 15s.; 24 V. Motor, 10" × 7", new, 10s.; 1 pint Blowlamp, 10s.; Kiwi castings, print, plug, 15 c.c., 10s. Various achromatic telescope lenses and eyepieces, stamp. Please add postage. Wanted, Steam Engine, 4 V. Boat Motor, Electric Locomotive or parts.—ALDERTON, Westfield Avenue, Harpenden, Herts.

For Sale, MODEL ENGINEERS, Vols. 57-67, 286 books, good condition. Offers.—SMITH, 39, Park Grove, Bexley Heath, Kent.

"Crystal" Paint Spray Gun for Vacuum Cleaner, 45s.—Poplar Farm, Creeting St. Mary, Suffolk.

Stark 3½" Precision Bench Lathe, new countershaft (needs striking arm), and new ½ h.p. B.T.H. Motor, £35 or offer. Handsome model Stuart 1" × 1" Horizontal Engine with gas-fired water tube boiler, all fittings. Large model Howitzer, fires ⅜" shell, compressed air. Best offers.—Week-ends only. Telephone Wallington 6885.

Wanted, Bound Volumes MODEL ENGINEER, books by Greenly, "L.B.S.C." Age immaterial, clean.—83, Boldmere Road, Eastcote, Pinner. 'Phone: Pinner 3497.

Welding, Sif-bronzing, Silver Soldering, etc.—14, Cransley Crescent, Henleaze, Bristol. 'Phone 68553.

Model Engineer Draughtsman required. Details of age, experience and salary required to—Box No. 4228, MODEL ENGINEER Offices.

Watchmakers Demobbed need Lathes to start work again. John Morris (Clerkenwell) Ltd. will pay high prices for Lathes by Lorch, Boley, Wolf Jahn, and American and Swiss makes.—64, Clerkenwell Road, E.C.1 CLE. 6077.

Make a Child's Super Pedal Car for Christmas. Instructions, scale assembly and detail drawings, 5s.—HATHAWAY, 55, Park Avenue, Swinton, Manchester.

Wanted, Pittler Lathe Booklet or Catalogue, loan or purchase.—Box No. 4232, MODEL ENGINEER Offices.

Wanted, Compound Slide Rest for 50 mm. Wolf Jahn Watchmaker's Lathe. Price and particulars to—RIMER, Burswell House, Hexham, Northumberland.

For Sale, Paxolin Tube, 6' × 1⅜" × 1/16"; 20, 40, 46 s.w.g. enamelled wire; also lathe attachment for winding coils; 2½" gauge 10 coupled "Austere Ada" chassis, valve gear, boiler, etc.—OTTLEY, Charterlea, Crowthorne, Berks.

Wanted, Traction Engine or Castings, suit 4" boiler. Exchange 4-6-2 Pacific, unfinished, or cash.—R. E. LEWIS, 74, Burnthwaite Road, Knotty Ash, Liverpool 14.

Wanted, Bassett-Lowke Calibran type Traction Engine, double cylinder preferred.—Box No. 4233, MODEL ENGINEER Offices.

Maintenance Engineer seeks position in hotel, S.W. London, used to steam, gas, electrical lifts and various mechanical appliances, industrial and domestic. Disabled ticket No. ECF 85.—ALBERT F. LAMBERTON, Alfriston, Sussex.

Instrument Makers and Machine Men for high precision work wanted immediately. Only skilled men need apply to Labour Manager, Ferrenti Ltd., Crewe Toll, Edinburgh.

Blueprints. Henry Greenly's world famous drawings, locomotives, rolling stock, etc. Send for list, 2½d., stating gauge.—HENRY GREENLY, 66, Heston Road, Heston, Middx.

Monomarks. Permanent London Address. Letters redirected. Confidential, 5s. p.a. Royal patronage. Write—MONOMARK, BM/MONO6, W.C.1.

Toymakers' Super Casting Moulds for Lead Toys and Plaster Craft. Over 100 latest designs. Fully illustrated catalogue, 1s. 6d. P.O.—AGASEE, 7, Stradbroke Road, Highbury Barn, N.5.

New Steam Engine Drawings. Send P.C. for details.—DRABBLE & SONS, 10, Ashton Drive, Hunt's Cross, Liverpool. Trade enquiries invited.

Wanted, complete or broken set of the "English Mechanics." Am willing to pay a very satisfactory price.—A. SPIRO, 2683, Buena Vista Avenue, Detroit 6, Michigan, U.S.A.

Watch and Clock Making. If interested you can get all tools and parts, also wheels cut from—JOHN MORRIS, 64, Clerkenwell Road, E.C.1. Regret no posts or lists, only counter service at present.

Light Lathe Work Wanted. Repetition or non-repetition. Enquiries invited.—MESSRS. GREENWOOD (Engineers), Brierley, Barnsley, Yorks.

Wanted, Gauge 2½" Steam Locomotive, gauge "1," Wagons, Vans, Track—GILLOTT, 39, Beryl Road, Noctorum, Birkenhead.

Pathe 17.5 mm. Talkie Projector, very good condition. Price £42 10s.—WOTHERSPOON, 25, St. John Street, Perth.

Wanted, Copy of book "Model Racing Yachts," by Edward W. Hobbs.—STEAD, 14, Leith Road, Sale.

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